



SATURDAY, SEPTEMBER 6, 1873.

## Pneumatic Foundations—Captain Eads' Rejoinder to Col. Washington Roebling.

The following is a copy furnished us by Captain Eads of his letter addressed to *Engineering*, in reply to Colonel Roebling's letter which we published July 19:

St. Louis, August 8, 1873.

I am again compelled to ask the favor of space in your column to notice the recent letter of Col. Roebling, published in your journal of the 27th of June.

To justify offensive personalities, he states that I charged him with wholesale robbery, not only of my own ideas, but also those of several others.

My letter does not bear any such construction. I alluded only to my air-lock arrangement, not because he had not copied others, but because that was the only one with which he connected my name in his pamphlet. Nor did I charge him with robbery of the ideas of several others. He stated that I had put in practical use the plan of Pfaunmuller. This I denied, and referred to his Brooklyn caisson to prove that it was he and not I who had adopted Pfaunmuller's design.

Colonel Roebling indirectly asserts that in my east abutment I copied the designs of his Brooklyn caisson. This cannot be seriously believed, even by himself. His misapprehension of the principles involved in the construction of his caisson, as

caisson at that great depth. He could have added also that my improvements in the second pier and in the east abutment enabled me to dispense with the use of coffer-dams entirely as soon as the caisson rested on the sand, and that I demonstrated this fact in time for him to have saved the useless expense of the coffer-dam of which he boasts.

On page 75 of his pamphlet we learn that the bottom was dredged to a uniform depth of 37 feet below high water to receive the New York caisson. The depth of the caisson was 22 feet of pine timber roof and 9 feet of air chamber, or 31 feet in all. At page 23 he shows that the caisson could be fully inflated without tipping. To submerge such buoyant timber with the caisson inflated would require at least eight or ten feet in depth of stone on top of it, as the area of the caisson was much greater than that of the masonry. This in high tide would leave masonry from two to four feet above the water, with the caisson landed on the bottom, and this proves how absurd is the statement in his letter that "The function of that coffer-dam was strictly confined to the flotation of a caisson in deep water and a tide way, where any support by screws was out of the question." *Support* by screws in such a case, or by coffer-dam, was totally unnecessary, the river bottom supplying it.

I understood at the time of sinking that the real object of his coffer-dam was to lessen the pressure on the bottom of the caisson, under the fear that rock might be encountered on one side, with sand on the other, on reaching the bed rock, and that this might, without the buoyancy of the coffer-dam, cause a tilting of the pier. My practice proved this was an idle fear. My east abutment caisson has a base of only 5,000 square feet, and that pier contains below the water line over 30,000 tons of masonry. My arrangement of air locks and air shafts enabled me

less design without a murmur. But patience cannot endure forever, and now it is laid at the door of Cochrane, Bush, Pfaunmuller, Castor and finally my esteemed friend, T. E. Sickles, is made to suffer, at the latest moment, "the practice of placing the lock entirely within the air chamber close to the bottom, which," we are told, "is one fraught with the greatest danger."

The Colonel says, "I intended to have placed the locks of the New York caisson entirely above the air chamber, but was deterred by the frightful waste of timber involved." After returning from St. Louis, however, he boldly adopted this practice, "fraught with the greatest danger."

It will not avail Col. Roebling even to say that I simply did what in "the abstract" had occurred to others before. When my suit was commenced I was informed that one of his assistant engineers had been detailed to examine into all published records of similar devices, for the purpose of refuting my claim to novelty. The result of this research has been made public to a considerable extent already by himself, and to a greater degree in the legal answer to my suit; but so far nothing has come to my notice affecting either the validity of my air-lock patent, or that for the pipes used so advantageously by him.

No one has ever proposed, in *the abstract* or in the concrete, so far as I know, to locate the air lock *within* the air chamber, either in pneumatic piles or caissons.

The distinguished inventor of the world-renowned "cut off" doubtless knows the purpose of Col. Roebling's eleventh-hour acknowledgment of obligations to him, when he says: "I am equally indebted to Mr. T. E. Sickles, who was then sinking the cylinders of the Omaha Bridge in 80 or 90 feet water with the air lock at the bottom of them." Mr. Sickles can tell him that my design would be as unnecessary, and as needlessly ex-

FIG. 1.

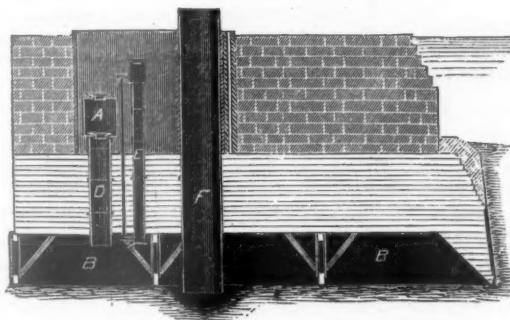


FIG. 2

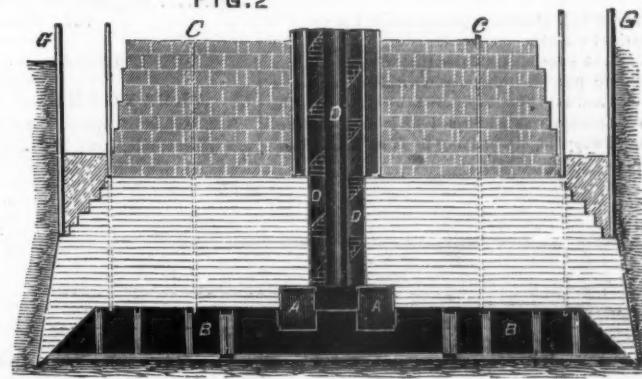
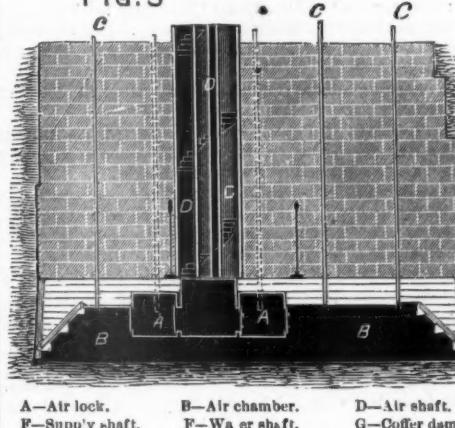


FIG. 3



shown in his effort to prove their similarity, would be, to engineers familiar with both, a sufficient refutation of his assertion. He says, "there was the same compact, heavy timber roof, composed of sticks crossing each other at right angles."

It is a very remarkable fact that no two sticks in the whole roof cross each other at any such angles. Aside from the fact that both caissons were chiefly formed of timber, and that both contained air chambers, there was no similarity between them either in plan or construction. Besides, my caisson was nearly completed before I saw the Brooklyn caisson. From my inspection of that and the experience related by Colonel Roebling in his pamphlet respecting it, I think it will never be copied.

He supports this assertion by another equally unfounded, viz.: that I ridiculed the idea of using timber when he was in St. Louis, in April, 1870,—the inference being that I adopted it in this caisson in consequence of his visit at that time. To refute this, it is unnecessary to state that the designs of the east abutment caisson were then completed. The contract for building it was made April 7, 1870. Besides, on page 26 of my report of May, 1868, I stated that it was intended to find this abutment on a *timber platform resting on piles*; it being at that time deemed by me too expensive to attempt sinking it to the rock, 136 feet below high-water mark, as was afterward done. I never approved of placing timber under the *channel piers*, for I believed the alternating pressures of the arches on each side of them, when loaded and unloaded, would produce an objectionable degree of oscillation in the piers if based on a material so elastic as timber.

Col. Roebling asserts that the sides of the caissons of my channel piers were "notoriously weak." I have no knowledge of any weakness in them that was not easily remedied without creating anxiety on the part of myself or assistants. Certainly none occurred of such importance as to become notorious.

I confidently predicted, he says, the upsetting of his Brooklyn caisson the first time it was inflated.

In this Col. Roebling is mistaken. To lessen the draft of his caisson while towing it into position, Col. Roebling proposed to fully inflate it. He claimed that it could be kept so while being towed. This I doubted. As it had no air-tight divisions in it, I believed that it could not be kept from tipping or rolling when inflated, and that it would thus lose a large portion of the air. On this simple difference of opinion he has the temerity to say that I predicted the upsetting of a floating wooden structure 102 feet wide and only 14½ feet deep, simply by the inflation of the air chamber within it!

In view of the pending suit, it is not the interest of Col. Roebling's company, or of himself, to admit that any advantage whatever could result in using any improvements, and this may account for the variety of reasons given for retaining the dam. Col. Roebling now, indeed, expresses an opinion of my air-lock design not at all calculated to elevate it in the public estimation. When, however, one appropriates the property of another and strives to avoid acknowledging the fact or paying for the use of it, his views of its value are generally received with some grains of allowance. In this case the public will doubtless appreciate the humility with which, for two whole years (prior to the suit), he silently, not to say patiently, fathomed this worth-

while opportunity was given Col. Roebling to inform himself of all my designs, I will be pardoned for quoting from a very recent private communication received by me from one of the most distinguished American engineers, and which gave me the first notice of Col. Roebling's recent letter. Speaking of this letter, this gentleman, who was in St. Louis at the time of Col. Roebling's visit, says: "Two things in it surprised me. One was the severe personal remarks against you; the other the studied effort to detract from your merit as the inventor and designer of important improvements in the plan of construction and method of sinking plenum pneumatic caissons, \* \* \* knowing as I did the pains you took to exhibit to him all your plans, to the minutest detail, and knowing that he had spent at least two days in critically examining the caissons and piers then being sunk. \* \* \* I was struck particularly with the perfectly free and liberal manner in which you devoted your own time and attention to those gentlemen, on the works and in the drafting office, in order to enable them to take full advantage of all the beautiful practical methods you had devised in connection with the caissons," etc.

Col. Roebling says that he designed the double locks of his caisson in May, 1870. This was after his visit to St. Louis, and after mine were in the hands of the contractor.

Fig. 2 is a section through the locks of the New York caisson. Fig. 3 is a section through those in my east abutment. All of my caissons had the locks similarly located. No. 1 was designed before and No. 2 after seeing my caissons.

Col. Roebling says: "I am compelled to state, however, in justice to myself, that in the arrangement of the New York caisson I was not influenced in the slightest degree by the

work of Captain Eads." If this be the case, the similarity in design of his caisson and mine must be recorded as the most remarkable coincidence in the history of civil engineering. He can only lessen the weight of testimony which the diagrams give against him by proving the prior existence of other designs containing any of the following features:

1st. A masonry caisson (or pneumatic pile) with the air lock placed within the air chamber.

2d. An open-top, water-tight air shaft within a masonry caisson (or pneumatic pile), to give access to the lock, and especially designed to obviate the necessity of an air-tight shaft and a water-tight envelope or coffer-dam around the outside of the masonry.

3d. The construction of such air shafts with wooden staves forming a vertical cylinder, as the most economic in material and workmanship.

4th. The convenient circular stairway within said shaft.

5th. The combination of small pipes with the air chamber outside of the air shafts, to facilitate the discharge of excavated material.

I most cheerfully solicit for Col. Roebling the aid of the entire engineering fraternity, to discover in chirstendom the prior existence of any one of these combinations and designs, all of which I claim were first suggested by me and all of which were used by Col. Roebling.

The water-tight curbs inclosing the air locks of the Brooklyn caisson were placed on these months after Col. Roebling's visit to St. Louis, and were doubtless suggested by what he saw there. The locks and slender air-tight shafts indicate the intention of using the old method of upper air locks, to be taken off and replaced every time the sinking of the caisson necessitated inserting an additional section of shaft under them. The fact can doubtless be shown that this part of the work was too advanced in the shops to justify copying my entire arrangement of air locks in that caisson also.

All credit of originality in these designs being studiously withheld from me by Col. Roebling proves to me the value of patent and copyright statutes.

In this pamphlet, at page 81, he states that the pipes (about 50 in number) were put into his caisson without the precise mode being determined as to how they were to be utilized. The maker of my sand pumps was addressed to know the cost of them, with a view, I suppose, of attaching them to these pipes.

publicly refute his published statements, he has now the effrontery to charge me with an attempt to manufacture public opinion.

Colonel Roebling evidently misunderstood my motive in not mentioning my suit against his company in my former letter. I did not do it, because I thought if it were shown that he had made misrepresentations respecting a matter where his professional reputation was even remotely concerned, and which was then awaiting judicial investigation, it would place him in the embarrassing position of endeavoring by unfounded statements to obtain a pre-judgment of the case in court. This I had no desire to do. By alluding to it himself, however, and showing by his definition of the patent in question that he fully understands that patents are granted for new and useful combinations, and that the air-lock patent he assailed was simply one of position in connection with a masonry caisson, he unwittingly proves what I had too much charity to express.

In your journal of May 16, I exposed the errors of Colonel Roebling's "harmless paragraph," and have here pointed out at least half a dozen more misstatements in his letter. This I have done at considerable personal inconvenience, and feel that my time is too valuable for such employment. I hope, therefore, any additional asseverations he has to make in the premises will be reserved for the authoritative tribunal to which he has forced me to appeal. The solemnity of judicial procedure will insure more careful statements, and give to them a greater degree of public confidence.

Respectfully,

JAS. B. EADS.

#### Standard Car Axle.

We give herewith an engraving, with the dimensions, of the standard car axle adopted by the Master Car-Builders' Association. As the engraving explains itself, no further description is necessary, excepting to say that the dimensions are for a finished axle.

#### Technical Regulations of the Union of German Railroad Management.

[Translated for the Railroad Gazette.]

#### ARRANGEMENT OF STATIONS.

§ 52. Extent of Station Grounds.—Station grounds should as a general rule, have, if possible, a horizontal extent of 2,953

§ 61. Distance between Tracks.—At stations a distance of at least 14 ft. 9 in. from center to center of tracks should be adopted.

For the main tracks between which platforms must be placed the distance should be at least 19 ft. 8 in.

§ 62. Sidings.—Side tracks may be constructed away from stations, wherever long trains pass each other.

§ 63. Curves of Sidings.—Sidings upon which complete trains turn should be connected by curves of at least 590 feet radius. It is desirable to construct the connecting curves at the extremities of stations with a radii of at least 984 feet.

Between the two opposite curves of a siding there should be a tangent of at least 19 ft. 8 in.

The elevation of the outer rail may be omitted on the curves of sidings.

The widening of the gauge on the curves may reach 1 1-5 inches.

§ 64. Switches.—Switches with movable points of equal length are recognized as the best.

The points of switch-rails should be capable of moving at least 4-1/2 inches.

The use of a locking hook is forbidden for automatic switches.

As a general rule, counterweights should be so arranged as to be capable of being reversed. The points will have their entrance ends as thin as possible.

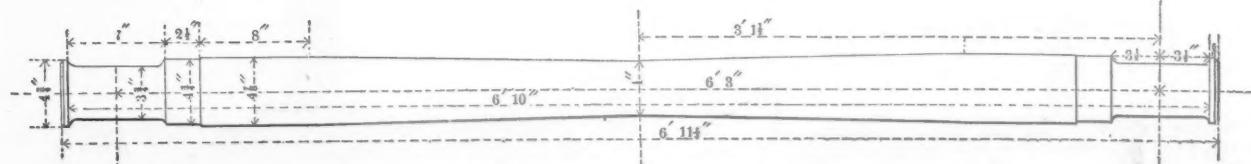
\* For tracks which trains pass over it is forbidden to use switches of a system such that, if the switch should be imperfectly turned, it would cause the wheels to fall down from the rails.

§ 65. Three-throw Switches.—On main tracks the placing of three-throw switches should be avoided.

§ 66. English Switches.—The use of English switches is authorized. In this case it is advisable to make the crossing angle as obtuse as possible, and, in all cases, to give the crossing a deviation of 1 to 10 at least.

§ 67. Junction Indicator.—Between connecting tracks, and at the place where the distance from center to center of tracks is 11 ft. 6 in., indicators will be placed, fixing the extreme points to which cars can be moved upon each of the tracks.

§ 68. Turn-tables.—At all depot stations there should be at least one turn-table. The turn-table should have a diameter of at least 39 ft. 4-1/2 in., in order that a locomotive and its tender may be turned together.



STANDARD CAR AXLE.

After learning that they were patented, it was found that the most economic method in the world of discharging the sand was by blowing it out, by the escape of air from the air chamber through these pipes, which were not known to be also patented. This plan had been tried previously at Omaha by Mr. Sickles, and was abandoned because, as he informed me, he found it too expensive. At page 83 of the pamphlet we are told of the tremendous velocity with which the material was carried out with this air blast, some of it to the height of 400 feet. This would indicate a prodigality of power. Col. Roebling, however, seems satisfied it is more economic than sand pumps, and I do not wish to controvert his statement on the subject.

Col. Roebling, with the greatest apparent sincerity, reproduced what he terms "the harmless paragraph which roused the Captain's ire." Now he either did or he did not know that he was not stating the fact when he asserted that the paragraph he reproduced in his letter was the one that called forth my corrections. He knew or he did not know that he mutilated the paragraph by leaving out of it that which was most objectionable to me, and which, if true, would destroy the value of my air-lock patent, which he correctly defines as being "solely one of position in connection with a masonry caisson." By omitting the words "in masonry caissons" he withholds from his readers that which constitutes the principal misstatement contained in his paragraph, and which, as it directly attacked the validity of one of my patents, justified me in promptly disproving all the statements in the paragraph by showing that neither Cochrane, Bush, nor Pfauemuller had ever proposed to do what I did, viz., to place the airlock in the air chamber "in masonry caissons." If he knew the paragraph was mutilated, the omission was clearly for the discreditable purpose of misleading the public and unfairly placing me in the position of caviling at a harmless paragraph. If the omission was, however, unintentional, he will of course merit the charity of the whole engineering fraternity, for an engineer, acting under the stimulus of the most honorable motives possible, who cannot correctly copy his own ideas when comprised in the small limits of a single paragraph, cannot be morally responsible for unceremoniously appropriating the ideas of others.

The following is a true copy of the paragraph Colonel Roebling undertook to reproduce:

"The idea of placing the air lock at the bottom of the air shaft, below the water level, in place of above it, in masonry caissons is not new, having been proposed in England as long ago as 1831 by Lord Cochrane, and again by Wm. Bush in 1841, and, still later, in 1850, by G. Pfauemuller, of Mayence. It nevertheless remained for Captain Eads, in his St. Louis caissons, to make the first practical application of the same on a really large scale in this country."

Having compelled me, in defense of my own property, to

feet; this length should be at least 1,805 feet in level and hilly country, and 590 feet in mountainous country. In level or hilly country a part of the level, at least 590 feet long, should be straight.

The steepest grades at stations may not exceed 1 to 400 (13.2 feet per mile).

§ 53. Separation of Passenger and Freight Offices.—At large stations the provisions for the accommodation of passenger traffic must be separated from those for freight.

The roads which give access to them should be separate. It is necessary, however, that the whole may be seen at a glance and that mixed trains may be made up rapidly and without too much trouble.

The arrangement of stations should be such as to facilitate the receipt and shipment of express freights by passenger trains.

§ 54. Intermediate Stations.—Intermediate stations should fulfill the four conditions following:

a. Trains should be able to pass them with safety.  
b. Trains should not be forced to pass over sidings uselessly.  
c. Meeting trains should be able to pass each other with safety.

d. Trains should have to move about as little as possible in entering switches.

These conditions can be completely fulfilled only on double-track railroads.

§ 55. Number of Tracks.—In each intermediate station there should be, beside the two main tracks, at least a third track and space for a fourth.

§ 56. Crossing of Tracks by Passengers.—An arrangement of stations which requires the crossing of the tracks by passengers is permissible, since this passage can be made without danger when trains are at the station.

§ 57. Junction Stations.—When two railroads belonging to different companies form a junction, it is advisable to unite in the buildings for passenger traffic, and the stations should be contiguous.

As a general rule, it is advisable to arrange such stations so that the building for passengers may be between the two railroads, and so that the platforms provided on both sides may communicate directly. It is well to establish between the two lines, especially for freight stations, easy connections.

§ 58. Blind Sidings.—Blind sidings must be avoided, as well as union stations as on the branches of the same company.

§ 59. Drainage of Stations.—The drainage of stations can be completely effected only by underground channels. In all cases, at least a drainage and deep ditches outside of the tracks must be provided.

§ 60. Enclosures.—Stations should be enclosed. Moreover, if there are covered platforms, they should be capable of being shut in, to hold the public at a distance from the trains.

§ 69. The bearing parts of turn-tables for locomotives should be made of iron or steel.

§ 70. Curves for Turning Vehicles.—The use of curves in place of turn-tables is not a good practice.

§ 71. Transfer Tables.—Transfer-tables for locomotives should be constructed of wrought-iron or steel. Transfer-tables of wood may be used for care. The ditches should be not less than 20 inches deep.

§ 72. Turn-tables and transfer-tables pits are prohibited on main tracks.

§ 73. Height of Platforms for Passengers.—It is advisable to give to platforms for passengers a height of 8-1/2 inches above the rails; this height may not exceed 15 inches.

§ 74. Width of Platforms for Passengers.—Platforms under station roofs and in front of station buildings should have a width of at least 24 ft. 7 in.; it is desirable to have a greater width at principal stations.

If there are columns upon the platforms, they should be at a distance of at least 9 ft. 10 inches from the center line of the nearest track.

§ 75. The best arrangements for arrival and departure stations consists of a covered yard.

There should be at least three tracks, or better still, four or five tracks, in order to be able to lay up reserve coaches or trains made up.

§ 76. Covered Platforms for Passengers.—Next to yards, covered platforms are preferable.

§ 77. Buildings for Passengers.—At great stations, the buildings for passengers should necessarily embrace the following parts:

A spacious hall enclosed on the side of the street and giving access to the windows of the ticket and baggage offices.

At least two waiting-rooms, with restaurant, ladies' closets and toilette closets.

An office for the station master and telegraph office.

The waiting-rooms and the baggage-rooms should communicate directly with the platforms.

There should be under the shelter designed for arriving trains an office for the distribution of baggage and, if there is need, a room for customs officers' inspections.

It is necessary that passengers should be able to leave the station without passing through the waiting-rooms.

§ 78. Drinking Fountains.—Fountains of drinking water for passengers should be provided near the platforms.

§ 79. Water Closets.—There must be water closets within the passenger buildings, or connected to them by direct and, if possible, covered passages; they should be provided also near the platforms and arrival places, and indicated plainly. The regular cleaning of water closets should be attended to.

\* Paragraphs so marked are obligatory.

Urinals should receive a continuous watering.

§ 80. *Names of Stations.*—The names of the stations should be inscribed in large letters, very distinct and visible from the platform. It is well to add the distances from the principal neighboring stations.

§ 81. *Station Clock.*—Every station should be provided with a clock regulated according to the local time.

At large stations it should be visible from the trains and from the approach to the station; it should be lighted at night.

§ 82. *Inclines for Vehicles and Animals.*—The incline for vehicles and animals should be placed near a station track, at a height of 3 feet 8 inches above the rail. It should have an inclination of 1 in 12, at most, and should be so arranged that the loading may be made at the end as well as at the side of the car.

There should be also two movable inclines.

§ 83. *Freight Depots.*—The most suitable arrangement for freight depots at intermediate stations is a building parallel to the tracks, having a platform 3 feet 8 inches above the rail, with lateral loading doors on each side, and a roof extending over the whole width of cars while loading.

On one side should be the track, and on the other side the street for wagons.

At large stations there should be separate depots, with open loading inclines for inflammable objects.

§ 84. *Hoisting Machines.*—Stations should have fixed and movable hoisting machines for loading heavy objects.

It is desirable to have hoisting cranes at each of the loading doors of freight depots.

Cranes should bear an inscription indicating the maximum of the load authorized.

§ 85. *Gauge for Loads.*—Near the depots on the loading tracks, there should be an apparatus by means of which the limits of height and width of the loads admitted on open cars may be determined and controlled.

§ 86. *Track Scales.*—Every principal and terminal station, as well as every important intermediate station, should have track scales upon which cars may be weighed and, in case of necessity, wagons and carts.

§ 87. *Fire Pumps.*—Every station should be provided, according to its importance, with a sufficient number of fire pumps. They should be stored in a fixed and safe place. If there are water pipes, they should be provided with screw spouts, to which the pipes of the pumps can be attached in case of fire.

§ 88. *Water Stations.*—There should be apparatus for providing water at suitable distances. They should be able to furnish water suitable for supplying the boilers, abundantly and safely.

§ 89. *Water Cranes.*—Separate water cranes are preferable to water cranes with extended arms designed for several tracks.

The conduit pipes from the tanks to the water cranes should be at least 6 inches in interior diameter.

\* The discharge mouths of water cranes should be at least 9 ft. 4 in. above the upper surface of the rails.

The waste pipes, as well as the columns of separate cranes, should be capable of being emptied completely.

§ 90. *Ash Pits.*—The pits for clearing the grates should be placed on the main tracks, so that this work may be done while the engine is taking water or coal. It is not proper to place open clearing pits before platforms.

§ 91. *Fire Pits.*—Well drained pits into which to draw the fires should be provided before the exit doors of engine houses.

§ 92. *Engine Houses.*—In engine houses there should be, for every locomotive, room enough to work on all sides of it easily. It is desirable to have large windows reaching nearly to the ground. There should be working pits between the rails from 2 feet 6 inches to 2 feet 9 inches deep, and with stairs. These pits should be drained by underground channels.

§ 93. There should be in engine houses a water-pipe communicating with a water reservoir placed at a certain height, and which, by means of a flexible pipe, should be capable of being connected with every locomotive.

Water cranes should be provided on the inside or outside of engine houses.

These engine houses should be provided with heating apparatus.

§ 94. The wood of the framework of engine houses should be at least 19 feet above the rails, the height being taken at the place of the smoke-stacks—that is, on the center line of the track.

§ 95. To facilitate the escape of smoke and steam, dampers or movable windows should be in the corner of the chimneys.

§ 96. The exit gates should be at least 15 ft. 8 in. high and 11 ft. wide.

For each file of two locomotives placed one behind the other, there must be an exit gate of its own.

§ 97. Every engine house should have a room for the engineers and other persons employed.

When an engine house is not near a repair shop, it should have, besides a forge, an adjusting shop, and a store room for iron, oil and other necessary supplies.

§ 98. *Sheds for Coaches.*—Sheds for passenger coaches should be so arranged that the making up of a train or an addition to one may be made with the reserve coaches easily and rapidly, and without compelling the coaches to pass by several switches. In sheds where the coaches are cleaned, water pipes and heating apparatus should be provided.

§ 99. The distance from centre to centre of tracks within the shed should be at least 14 ft. 5 in.

§ 100. The doors should be at least 11 feet wide and 15 feet 8 inches high.

§ 101. *Repair Shops.*—The establishment of central shops is preferable to that of several small shops. They should be placed at the principal points of junction, and should have an extent and a supply of tools sufficient to enable repairs of rolling stock to be executed completely and rapidly.

There should be in these shops apparatus for forcing wheels on and off axles, and apparatus for ascertaining exactly the load supported by each truck or pair of wheels.

In new constructions the eventual increase of the different departments should be made possible.

§ 102. *Covered Shops.*—Covered shops should be made large enough to provide for the repair of 25 per cent. of the locomotives, 8 per cent. of the coaches, and 3 per cent. of the cars.

It is necessary, further, to be able to lay upon interior tracks 5 per cent. of the total number of coaches and cars.

#### COACHES AND CARS.

\* § 133. *Width.*—The width of passenger coaches and baggage cars may not exceed 10 feet, including the steps and all fixed projecting parts.

\* The exterior width of the car bodies should not exceed 8 ft. 9 in. for coaches and baggage cars which have doors opening outward.

When the doors are open the total width should not exceed 12 ft. 9 in.

\* Coaches which have no side doors opening outwards should not have an exterior width of car body greater than 9 ft. 6 in.

\* Freight cars, including the sliding doors, the steps and other projecting parts, should not exceed a width of 9 ft. 6 in. as far up as the height of 4 ft. 6 in. when they are loaded.

\* Higher up, the projecting parts should not exceed a width of 9 ft. 10 in.

§ 134. *Heights.*—For coaches that do not remain exclusively upon the lines to which they belong, and which are to run also over other railroads, the highest points of the car body should be not more than 12 ft. 4 in. above the rail. If there is in the center a covered look-out for the guard, it should not exceed, at its highest point, a height of 15 feet, and the step should not be more than 9 ft. 4 in. above the rail.

§ 135. *Distance between Axles.*—For lines which, on the open road, present numerous curves, it is advisable not to exceed as the distance between fixed axles:

13 ft. 1 1/2 in. for curves of.....	820 ft. radius
14 ft. 5 1/2 in. .....	984 "
17 ft. 3 1/2 in. .....	1,312 "
19 ft. 8 1/2 in. .....	1,640 "
22 ft. 3 1/2 in. .....	1,968 "
25 ft. 7 in. .....	greater radius.

For cars with more than two axles, without trucks, and with a total distance of more than 13 ft. 1 1/2 in. between axles, an arrangement should be adopted which permits the intermediate axle to play sideways within suitable limits.

A separation of less than 8 ft. 2 1/2 in. between the axles of freight cars should be avoided. It is advisable, as a general rule, not to make this distance more than 13 ft. 1 1/2 in.

§ 136. *System of Passenger Coaches.*—It has been established that four-wheel passenger cars are as suitable for use as those with six wheels.

§ 137. *Closing of Coaches.*—The doors of coaches should be capable of being opened from the outside only, when they are on the sides of the coaches. Each of these doors should be provided with a double fastening.

§ 138. *Car Frames.*—The frames of cars should be braced in such a way that their rectangular form cannot be changed without violent effort. Sills of iron, as well as frames wholly of iron, are recommended.

The interior height of the car body for passenger coaches should be at least 6 ft. 6 1/2 in.

For freight cars a mean height of 4 feet above the rail for the body is advisable.

§ 139. A sufficient number of cars should be provided with the supports necessary for placing signal lanterns.

\* § 140. *Car Inscriptions.*—Every car should bear marks indicating:

\* a. The railroad to which it belongs.

It is well to add to the mark adopted the name of the railroad in full.

\* b. The number under which it is inscribed in the registers of the repair and inspection shops.

\* The numbering should be current for all the material of a railroad.

\* c. The tare, including the wheels and axles.

\* d. The tonnage.

\* e. The date of the last inspection.

\* § 141. *Oil Boxes.*—The use of oil as a means of lubrication is considered the best. The oil boxes should be of as simple a construction as possible, and close solidly and hermetically so that dust cannot penetrate nor oil run out; they should be capable of being inspected rapidly.

§ 142. *Springs.*—The springs of freight cars may be of steel or india rubber. The best bearing springs are of steel, and composed of leaves 1/2 inch thick at most. Their length should be at least 4 feet 11 inches for coaches, and 3 feet 3 1/2 inches for cars. Springs supporting the sills directly without the intervention of joints or sleeves are not recommended.

\* § 143. *Brakes.*—The brakes of cars should be capable of holding the wheels, even when the car is loaded, or capable of producing an equivalent effect.

\* § 144. The brake cranks should, in putting on brakes, all turn in the same direction and to the right.

§ 145. The lowest parts of the brake should always be at least 5 inches above the upper edge of the rail.

§ 146. *Draught and Buffing Apparatus.*—The two cross-beams of the frame of every vehicle should be provided with apparatus for drawing and for meeting shocks.

Continuous draw-bars are recommended for coaches and are necessary for cars.

\* § 147. *Dimensions of Buffers.*—The distance from center to center between the buffers should be 5 feet 9 inches.

\* The normal height of the axis of the buffers above the rails is fixed at 3 feet 5 inches.

\* For empty cars, a variation of 1 inch above this height is admissible, and for loaded cars a variation of 4 inches below it.

\* § 148. The distance from the surface of the buffer plate to the buffer beam should be at least 14 1/2 inches when the spring

is wholly compressed. One of the two buffers of the same buffer beam should have a flat and the other a rounded face, and they should be so arranged that, seen from the middle of the car, the flat face will be on the left side and the rounded face on the right.

\* The face should be at least 13 1/2 inches in diameter.

The projection of the axis of the rounded face should be at least 1 inch.

\* Between the buffers and draw-hook there should remain a clear space sufficient for a man to move in it easily and without danger in order to couple, even when the buffers are wholly compressed.

\* § 149. *Draught Apparatus.*—All draught apparatus should be such as will project from the buffer beam not less than 2 inches and not more than 6 inches.

\* § 150. *Projection of Draw Hook.*—The point of attachment of the draw-hook should be, in its normal position, at least 14 1/2 inches from the outer surface of the buffer plates.

\* Variations of 1 inch shall be admissible above and below the measure.

§ 151. *Form of Draw Hooks.*—Every car should be provided at the two end cross-beams with draw-hooks made after the drawing furnished, and for cars with strengthened draught, conformable to the standard drawing of that apparatus. It should have also suspension hooks for the hangers or safety chains. If jointed safety chains are used, they should be made after the last named design also. In the construction of new cars this pattern must be conformed to.

\* § 152. *Coupling.*—The coupling of coaches and baggage cars should be made by means of a screw coupler.

\* The general adoption of this system for cars is equally necessary.

In all cases, each end of the car should be provided with a coupling (screw or chain).

\* § 153. *Dimensions of Couplings.*—The dimensions of the coupling corresponding the dimensions fixed upon for buffers, draw-hooks, etc., will be found in the drawings supplied. \*

\* § 154. *Safety Chains.*—All coaches and all baggage cars should be on their buffer beams, besides the draught apparatus, two safety chains.

\* Safety chains may be omitted on freight cars if the continuous draw-bar is so fashioned as to have in no place a section of less than 2 1/2 square inches, if the strength corresponds, and if, further, the screw coupler has a minimum section of 2 square inches.

If the safety chains are omitted, an arrangement must be adopted for each end of the car which, in case of the breaking of the principal draught apparatus, will render it possible to continue to haul the car, and also admit of hooking to it the safety chains which might be on the other cars.

§ 155. *Distance between Safety Chains.*—The distance between the safety chains should be 5 ft. 5 in.

\* The axes of the draw hooks of safety chains and of the buffers should be in the same horizontal plane.

§ 156. *Dimensions of Safety Chains.*—Every safety chain completely extended and measured to the point of attachment to the hook should stretch 12 inches beyond the plates of the buffers. The lower end of safety chains hanging to the buffer beam should be at least two inches above the head of the rail.

\* Safety chains should be provided at their ends with solid hooks, the sections of which, however, should not be more than two inches high, nor more than 1 inch wide. Hooks should not be hooked to each other, but to a link.

\* The fastening of safety chains should be elastic.

#### The Red Light.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There is a question I have often thought to propound in railroad circles, but have thus far postponed, and this is: Who invented the red light? or rather, who first thought of using it as a signal on railroads?

Soon after the Pennsylvania Central was opened, i. e. about twenty-five years ago, there was an accident and loss of life, caused by one train running into the rear of another, which had broken an axle, in a deep cut at night. Railroad disasters were new then, and the affair called out a great deal of newspaper comment; but the blame seemed all to attach to a brakeman sent back to notify the following train. Two days afterward, at dark, I was walking on the track from Wilkinsburgh to Swisvale, when a train came up behind me with its brilliant white head-light. I stepped off until it passed, then stepped on again, and was forcibly impressed with the suddenness of its disappearance in a place where the road is straight for half a mile before me where I walked. I said, mentally, what is to hinder the next train running into that, if any accident should detain it? The answer came to my mind like a revelation—a red light. No train should run at night without a red light on the rear platform.

Next day I wrote and published, in the Pittsburgh Saturday Visitor, an editorial urging the adoption of this precaution against that class of accidents then occupying public attention. Next week every night train on that road had a red light on the rear platform; and I was led to believe at the time that it was in consequence of my suggestion. Now, as women do so little in the line of original suggestions and inventions, I would like to know if I were the first to think of this beginning of the present signal system, that we may have this much more on the credit page of our general account.

JANE G. SWISSELM.

No. 618 West Monroe street, Chicago.

#### A Railroad Fire-Engine.

The Virginia & Truckee Railroad Company has fitted a fire-engine on one of their locomotives in consequence of the frequent occurrence of fires along the road in d-pots, wood-piles, etc. The description given is somewhat indefinite, but the fire-engine appears to be simply a steam pump placed on top of the boiler in front of the dome and so fitted as to be supplied with steam from the boiler.



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CONDUCTED BY

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## Editorial Announcements.

**Removals.**—The Chicago office of the RAILROAD GAZETTE has been removed to No. 77 Jackson street, opposite Third avenue. The New York office of the RAILROAD GAZETTE is removed to Room 131, No. 73 Broadway, opposite the upper elevator landing.

**Correspondence.**—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

**Inventions.**—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

**Articles.**—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

## THE ERIE REPORT.

The report of the President of this company, made to the directors on Tuesday last, gives, for the first time in the whole history of the corporation, we think we may safely say, a satisfactory account of the condition and working of the lines of the company in detail, together with the purposes of the administration. The fulness of its tabular statements is an excellent thing in a report, but the intelligence with which they are prepared is a better; for, instead of a multitude of figures without meaning, we have inferences and deductions from the accounts of the company which are at once intelligible and significant. The tables mean something, and it is easy to find what they mean, and the information in them will not only serve to enlighten the shareholders as to the condition, resources and prospects of their property, but its employees as to the best fields for developing its resources, the limits of its powers, and the particulars in which reforms are most practicable.

The report covers the entire period since the report to the State Engineer and Surveyor was made, and covers three months of the period for which figures were reported early in the year to the Investigating Committee, when the accounts were not complete.

This period covers the two best and the worst quarters of the year; and the quarter from between June and October will not be likely to show earnings so great as the average included in this report, though the difference should not be considerable. Briefly, the results are the receipt of \$14,527,193, at a cost for working and rentals of \$10,093,344, leaving a net income of \$4,433,849. Of this net income, interest, rents, car mileage, taxes, etc., absorbed \$3,024,849, so that the divisible earnings for the nine months were \$1,409,000. This is sufficient to give a dividend at the rate of 7 per cent. per year on the preferred stock, and one of 1 1/4 per cent. on the common stock. The earnings for this period were not, therefore, enough to pay the half-yearly dividend of 1 per cent., which was declared last Tuesday, but the possession of a considerable undivided surplus of the

previous year's earnings made it possible and, doubtless, advisable.

As to the general proposition, that the policy of the company should be to make all the expenditures necessary to enable it to carry economically all the traffic it can get, it is doubtless well founded. All the money the company can get at 7 per cent., if economically invested in improvements, is likely to earn something more than the interest; but that the stock can so be made to earn large dividends by no means follows.

A more imperative necessity even than the payment of dividends demands the improvement of the road. It cannot long remain as it is and keep out of bankruptcy. For it must be remembered that the road must not only be able to do its work as cheaply as it is doing it now, but cheaper, and probably, within no very long period, very much cheaper. It has competitors for all of its thorough and much of its local traffic, and it must carry as cheaply as these competitors or not carry at all. They are making very great and costly improvements which will probably considerably reduce the cost of transportation over their lines. The Erie is very much behind them now, and it will be hopelessly behind them if it stands still now while they are going forward with greater rapidity than ever before. A change of gauge and a double track are simply indispensable, and if the shareholders do not see that they are provided, they will be simply throwing away their property.

If we had time and space we could give many very suggestive deductions from the tables in the report. That concerning the freight business, for instance, shows that of a total tonnage mileage of 702,449,424, 31.5 per cent. was way freight eastward, earning 36.7 per cent. of the freight income; 14.6 per cent. was way freight westward, earning 17.7 per cent. of the freight income; 38.6 per cent. was through freight eastward, earning 30.9 per cent. of the freight income; and 15.3 per cent. was through freight westward, earning 14.7 per cent. of the freight income. Thus the total way freight formed 46.1 per cent. of the freight movement and earned 54.4 per cent. of the freight revenue; while the total through freight formed 53.9 per cent. of the freight movement and earned 45.6 per cent. of the revenue. Dividing by directions, 70.1 per cent. of the tonnage mileage and 67.6 per cent. of the freight earnings were from east-bound freight; and 29.9 per cent. of the tonnage mileage and 32.4 per cent. of the freight earnings from west-bound freight. The earnings per ton per mile were: way eastward, 1.81 cents; way westward, 1.77 cents; through eastward, 1.32 cents; through westward, 1.51 cents; and the average for all tonnage was 1.56 cents per mile, in 1873, against 1.52 for the same period the previous year.

Another most suggestive table is that giving the earnings and expenses of each of the many branches, which we publish. The remarkable fact is there shown that of fifteen branches reported only one earned its expenses and rental, and that the aggregate direct loss in working them was \$510,425.51. Doubtless there were indirect gains, through the earnings from traffic which they gave the main line, part of which but for the lease would have gone to other roads, and not unlikely this gain balanced or overbalanced a direct loss. The main line seems to be worked quite cheaply (for 54 1/2 per cent. of its receipts.) Doubtless some of these lines were leased with the intention of profiting the lessor at the expense of the lessee. The rental of the Newark & Hudson line is one-half more than its gross earnings, and the working expenses nearly twice as much, and for every dollar the Erie receives from it it pays out three and a half. The Jefferson Branch is worked at a loss of 150 per cent. The rental of the Buffalo, Bradford & Pittsburgh is four times its gross earnings, and the working expenses nearly as much more, so that eight dollars are paid for every one received from it. The working expenses of the Niagara Falls Branch were 210 per cent., while the rental was 75 per cent.

But we cannot now make further examinations of this exceedingly interesting report, which is well worth studying by those who wish to know something definite of the business of the corporation, most of all doubtless by the company's own employees, and hardly less so by the company's competitors, who, however, hardly need to be advised to examine it critically.

## CRITICISM OF THE ERIE DIVIDEND.

The Erie dividend is the subject of criticism in the New York *Times*, which says it cannot have been declared out of the net earnings of the last half year, because there were no such earnings, but a deficit instead. Ordinary mortals hesitate to make such criticisms for lack of knowledge of one of the two essential elements. These elements are, first, the gross receipts, which are known, the company reporting them weekly; and, second, the working expenses, which the company is in the habit of keeping to itself until it makes its annual

report to the shareholders and that to the State. But this withheld information the *Times* pretends to have obtained from the company's books. "We have not obtained permission to copy these figures," it says, "but never mind that." It then gives statements of expenses for each of the six months, divided under the heads, "general expenses," "transportation expenses," "road expenses," and "rolling stock expenses," the totals of which, compared with receipts, are as follows:

Gross receipts, first half of 1873.....	\$9,176,007
Expenses.....	7,807,117
Balance.....	\$1,368,890

Now as the charge for interest on the bonded debt, rents, taxes, etc., for the six months amount to \$2,762,396, the *Times* concludes that instead of a divisible surplus there is really a deficit of no less than \$1,398,506 in the last half year, and that so far from making a dividend of 1 per cent. on the common stock, the company should rather pass the dividend on the preferred stock, and then have a debt equal to about 2 per cent. on the common stock.

The *Times* claims to have proved its statements, but it will be seen that the entire evidence lies in its simple assertion that the figures it gives us are the true expenses, and the working expenses only. Certainly the is not the kind of evidence needed for proof. And it is not even necessary that the *Times* should have misstated the expenses to make its inferences grossly incorrect. There is no shadow of proof, no statement, even, that these expenses are the working expenses only. On the contrary they indicate on their face that they cover something more. It does not seem to have occurred to the critic to inquire into the cause of the great discrepancy between the official figures for the expenses for the first half of 1872 and its own figures for the corresponding term in 1873, although he took pains to compare them. He gives them as \$6,431,610 in 1872 and \$7,807,117 in 1873, showing the large increase of \$1,375,507, which is more than 21 per cent., the receipts meanwhile having increased only about 4 per cent. This needs looking into, though the *Times* didn't seem to think so. It might have been caused by a great increase in traffic calling for a great addition to the work done, accompanied by a decrease of rates. But we know that there was no decrease of rates in the six months; that therefore there could not have been any considerable increase in the work done, else there would have been a corresponding increase in receipts. Or it might have been caused, partly, at least, by a great increase in the cost of materials and labor; but here again we know that there was no such increase, at least not enough to make any considerable difference in expenses. Or a prodigal, inefficient or peculating administration may have made such an increase possible; but the distinguishing features of the present Erie administration are economy, efficiency, an honesty which, we believe, no one has suspected, and an organization which has made it almost impossible for the servants of the company to defraud it to any large extent. And not only is this the present condition of the administration, but the preceding administration was in almost all respects the reverse, and the faults of its management were by no means ended when it was removed, nor for months afterward. If an honest and capable management with a most efficient staff cannot equal in economy the management of Gould and Fisk, then shareholders should go to the penitentiary for managers hereafter.

The natural inference, without any further knowledge than the very figures and statements that the *Times* gives is that the expenses reported are simply the footings of total expenditures made by the different departments during the half year, including all payments for new constructions and additions to the property, as well as the renewals, repairs and other working expenses. The expenditures for improvements of the road and additions to the property are known to be large: the company has negotiated large loans for the purpose of making them. But it is as absurd to reckon these with the working expenses as it would be to add the cost of the third and fourth tracks which the New York Central is constructing to its working expenses and pretend that it ought to be paid out of the net earnings of the years when it is made, before making dividends.

The *Times* says: "Railway and business men everywhere will understand the above figures." We think they will, which is more than the *Times* has done; but instead of concluding, as it has done, that "the Erie road is rotten to the core; that it is neither more nor less than a gross swindle; and that it is being fraudulently administered by the present directors," as the *Times* does, they will more probably conclude that they know no more of the net profits of the half year in question than they did before the *Times* published its wonderful figures; and we fear that some of them, not sufficiently impressed with the integrity and disinterestedness of that journal,

may rashly conclude that somebody wanted to pull Erie stock and that the *Times*, for some reason, wanted to help him; and such people will hardly be likely to assign a creditable "reason" for such sympathy.

We have nothing to say for Erie stock. We fully believe that there is fifty millions too much of it, and that this load tied about the company's neck by the old administration, with the connivance really of the State of New York "represented in the General Assembly," will remain a terrible one to carry. But when the shareholders have chosen a rarely capable administration, and so far sustained it in its reforms, we are at least willing to have them make their most vigorous efforts to improve their property, and a little indignation to see a systematic effort made to unduly depreciate it.

So far we had written before the publication of the report for the nine months, which we give elsewhere. It will be seen that the company's figures give the working expenses for nine months, including the six for which the *Times* gives its figures, as \$9,751,650.62, which is only \$1,943,534 more than the *Times* figures for six months; so, according to that authority, the Erie Railway was worked during the last quarter of 1872 for the very small sum of \$1,943,534!

#### THE RESISTANCE OF RAILROAD TRAINS.

A great deal has been said and written within the past year or two regarding our want of knowledge of the power required to move American rolling stock on American railroads. At their annual meeting in Boston last year, the Master Mechanics' Association appointed a committee to investigate and report upon this subject, and since then a number of master mechanics, to our knowledge, have been making and experimenting with dynamometers to determine the power required to move cars at varying speeds and under different conditions. On another page we give a lithograph of an instrument of this kind, used on the Philadelphia & Reading Railroad. Others have been made by master mechanics of other lines, and an engraving of one which is manufactured and offered for sale may be found in our advertising columns. Notwithstanding the fact that all this attention is given to the subject, thus far no really valuable results have been made public, and we are now nearly as much in ignorance of the whole subject as we were ten or more years ago.

Now, the reason for this we believe to be that it is impossible to measure accurately the resistance of one car or a train of cars by such instruments as have been made. The writer has recently had an opportunity of observing the indications of a dynamometer in which steel springs were used to measure the resistance offered by a train of cars. It was found that the variations which it indicated were so great and so frequent that nothing more could be done than to make shrewd guesses at the average shown. The fact is, that the resistance of a train is controlled by so many different conditions and causes that it is constantly varying, and within very wide limits. It requires more power to start a train than to keep it in motion at a slow and uniform speed. In other words, the *friction of rest* is greater than the *friction of motion*. When the speed of the engine is accelerated, the train resistance is greater than when it is diminishing, although at the moment of observation they may each be moving at the same absolute speed. An ascending grade, a bad track, a curve, varying wind, the rate of speed, the application of a brake, the condition of lubrication and other causes all help to vary the strain on the dynamometer, so that it is impossible from merely observing its indications to form any accurate idea of the resistance of the train which it indicates. The element of speed has so important an influence on the resistance of the train that unless some accurate measure of it can be taken simultaneously with the indications of the dynamometer, it is impossible to draw any deductions from the latter which will have any value. To do this, and also to be able to tell what the dynamometer does indicate, both it and the speed indicator should be self-registering. A direct comparison could then be made of the one with the other, and an average of the records of the resistance for any given time could be calculated from the diagram drawn by the dynamometer. Such an instrument would require considerable skill to design and construct, and would moreover be costly. In the experiments made in France by MM. Vuillemin, Guebhard and Dieudonné they used such instruments, which were placed in a four-wheeled car which was used especially for this purpose, and which is described in Spon's Engineering Dictionary. The experiments made by those gentlemen were with European rolling stock, and are therefore almost useless to us. Without similar instruments it will, we believe, be impossible to get any correct information regarding the resistance of our American cars. Therefore the com-

mittee of the Master Mechanics' Association who were authorized to expend \$500 to construct a dynamometer should be careful to procure one which will be self-registering, otherwise it is very doubtful whether they will find it efficient in determining the resistance of trains. In fact, the amount to be expended for this purpose is quite insufficient to construct the instruments which are needed, and without which no new or valuable information can be elucidated.

A little experience in attempting to determine the resistance of trains will show the experimenters the difficulties which must be encountered before any accurate results can be obtained. The first impression of a person who is interested in this subject is, that all that is necessary to do to determine the resistance of a train is to attach to it an instrument which will indicate the power exerted to draw it. It will be found, however, that the problem is not nearly so simple as it seems, and that the variation of resistance which the instrument indicates defies all analysis. It is for this reason, we believe, that so little actual information can be procured regarding this subject. That it is sufficiently important to justify a liberal outlay of money, to arrive at accurate results, all who have had occasion to use data relating to the power of engines have reason to know. The difficulty is to convince those who should contribute to defray the expense of such experiments of the practical value of the information which could thus be obtained.

#### An Engineering Library.

Nearly all engineers and those engaged in kindred pursuits have had occasion to feel the want of a good library made up of the literature referring to their profession. At present none such exists in this country, at least none which at all approximates completeness, or which has much value to a person making a thorough investigation of subjects about which much has been written. There is, besides, a terrible destruction constantly going on of historical matter relating to the engineering of this country. While some of the early engineers are still living, it is even now almost impossible to collect the records of their early works. This is especially true of the early history of railroads. Their development in this country, while it was much aided by the experience and practice of England, was nevertheless carried on independently and has a history of its own which has never been adequately written. There are many other similar instances, where the history is perishing simply because there is no person or place to preserve it. If, therefore, a library were established in which *all* the literature—much of which is of a sort of fugitive character—could be collected and catalogued and used for reference, it would be furnishing the material for a more enduring monument of the past than it would be possible to build in any other way.

It is not, however, of the past alone or chiefly that such a library would or should refer. With the rapid advance of engineering in every civilized country in the world there is a mass of literature growing up simultaneously, which is becoming daily more and more valuable, and which as engineering in this country advances must be closely studied if we are to keep even with the advance elsewhere. Unfortunately for engineers the books relating to their profession are usually more costly than those of almost any other. A lawyer with a respectable practice can afford a respectable law library, but none but a millionaire could afford to own anything like a complete library of engineering books. This makes it so much more important that a really good collection of books of this kind should be made accessible to engineers who feel inclined to make investigations of any professional subject.

We are, therefore, glad to learn that a movement has been set on foot by the American Society of Civil Engineers to establish a library, which shall be, at least to some extent, complete and full. The following resolution was introduced and adopted at the meeting in July:

"Whereas, The foundation of a library and museum, which contains within itself all accessible published matter relating to the history, theory and practice of engineering, the construction and management of public improvements, and the methods and cost of manufacturing operations, with illustrations by models and samples of the results thereby obtained, must be invaluable, not only to the profession, but to all who are interested in the pursuit or the application of practical knowledge; "Resolved, That a committee consisting of the President and nine other members, to be named by him, with power to fill vacancies, be appointed, to devise a plan whereby such a library and museum may be founded; the funds obtained for its collection, management, increase and maintenance; a suitable place secured, where it and other possessions of the Society may be preserved, and its advantages enjoyed by members and others connected therewith, irrespective of their location; the committee to report to the Society before October 1; the report to be printed and distributed to members for examination and approval, and action thereon made a special order for the annual meeting, to be held November 5, 1873."

The committee appointed consists of Mr. Horatio Allen, New York; Col. Julius W. Adams, Brooklyn; Messrs. E. S. Chesbrough, Chicago; Alfred P. Boller, New York; Thomas C. Clarke, Philadelphia; James O.

Morse, New York; Charles Hermany, Louisville; Gabriel Leverich, New York; Charles Paine, Cleveland, and Gen. Theodore G. Ellis, Hartford.

It will be seen that the project has been placed in good hands, and we believe that if it is properly presented to the older and wealthier engineers of the country many of them will feel inclined to contribute liberally to establishing such a library. Of its value there can be no doubt, and it would be not to those alone who would consult it personally, for the benefit which they would receive would be shared by the public generally. It presents an excellent opportunity to some one or more wealthy men to appropriate an adequate sum of money in a way which would commemorate not only their liberality but their wisdom too. That the members of the profession possess the former characteristic the world has often had occasion to know; that wisdom is also theirs we hope will soon be shown by the formation on a sound and enduring basis of a library such as is contemplated in the resolution above.

#### Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

*Springfield, Athol & Northeastern.*—Extended from Barrett's southwestward 10 miles to Indian Orchard, Mass. *Selma, Marion & Memphis.*—Extended from Greensboro west 8 miles to Sawyer's, A. S. *Southern Pacific.*—The Hollister Branch has been extended from Hollister southward 6 miles to Tres Pinos, Cal. *Ware River.*—Extended from Barre Plains, Mass., northward 9 miles. *Cleveland, Mount Vernon & Delaware.*—Completed by the extension from Sunbury southwestward 22 miles to Columbus, Ohio. *Cairo & Fulton.*—Extended from Little Missouri River southwest 33 miles to Fulton, Ark. *Pennsylvania—New York Division.*—The line in Jersey City to Harsimus Cove,  $\frac{1}{2}$  miles, is completed. *Atlanta & Richmond Air Line.*—Completed by the laying of track 69 miles from a point 86 miles northeast of Atlanta, Ga., east by north to the Saluda River, S. C.

This is a total of 158½ miles of new railroad, making the mileage completed in the United States in 1873, 2,284 miles.

#### Dynamometer Used on the Philadelphia & Reading Railroad.

We give this week a lithograph of a dynamometer used on the Reading Railroad. The spring is made in four sections, with five spring plates in each. The spring plates are made of  $\frac{1}{2}$  inch steel, 24 inches long by 4 inches wide in the center and  $1\frac{1}{2}$  inches at the ends, and are kept separated by distance pieces to avoid friction. In graduating the instrument only one section at a time is put in place, and weights of 1,000 pounds each are applied. The deflection is then noted until it is loaded with 10,000 pounds. The instrument is very simple, and more delicate and reliable than any other form which we have thus far seen.

**IOWA TRAFFIC**, we have noted heretofore, has not of late years grown very fast, which is largely due to the fact that the State does not grow very fast—that is, compared with its previous rate of growth, although the largest part of its area, doubtless, is still uninclosed and not largely utilized. But Iowa is probably the most exclusively agricultural of any of the large States; its manufactures are few, and it has no considerable commercial city in all its borders. It might be thought that the lack of one large one would be made up by the number of smaller ones; but this is not the case. The State has completed a census (in connection with the assessments, we believe) for 1873, which shows that there are in the State but twenty towns having 3,000 or more inhabitants, the largest (Dubuque) having but 22,151, while the aggregate of the twenty is but 168,766, or not more than half the population of Chicago or St. Louis. A comparison with the returns of the United States census of 1870 shows that these towns as a whole have grown slowly (for Western towns), having had an aggregate population of 150,857 in 1870. The increase for the three years is thus about 12 per cent. Usually in Western States few towns grow rapidly until most of the land is occupied for farms, after which there is little growth except in the towns. So in Illinois there is little increase of population outside of the towns and villages, while the gross increase is rapid. Some of the Iowa towns show a decrease for the three years, among which are Keokuk, Lyons, Mount Pleasant and Sioux City.

**THE AMERICAN RAILROAD MANUAL**, edited by Mr. Edward Vernon, concerning which we have spoken recently, is ready for delivery doubtless at the time this reaches our readers. It forms an imperial octavo volume of 720 pages, and the price is \$7.50. The American Railroad Manual Company, No. 3 Park place, New York, and J. B. Lippincott & Co., of Philadelphia, supply the work. We have not seen it at this writing, and so cannot speak further of its contents.

The shops of the Schenectady Locomotive Works are to be increased by the addition of a building 400 by 80 feet. About 300 feet of this is to be an addition to the blacksmith shop, the remaining 100 feet being for a new machine shop.

The new buildings of the Oxford Co-operative Car Company at Oxford, Pa., comprise an erecting shop 170 by 70 feet, the second story of which is to be used as a cabinet work shop, and a planing mill 70 by 40 feet, the second story of which is the sash shop. A paint shop 179 by 70 feet is well under way, and work is also going on on brick buildings for smith shop, engine house and dry house, and on the transfer table. The machinery in the planing mill is nearly all in place.

## Report of the Erie Railway Company.

The following is the report, in full, of the President of the Erie Railway Company, made at a meeting of directors, September 2, followed by a summary of the contents of the tables: *To the Stockholders and the Board of Directors of the Erie Railway Company:*

In making a report to the directors and stockholders of this company for the last semi-annual period it seems proper that I should, in the first instance, allude to certain general considerations affecting the interests of this company, before discussing its financial condition and resources.

A very large proportion both of the stock and bonds of this company are owned in England and on the Continent of Europe. As a matter of necessity, the interests of this large body of our constituents find no other representation save that afforded to them by a few of our active friends and allies in the city of London, and by the officers and directors of the company in New York. At the recent election nearly three-quarters of the whole capital stock was represented in person or by proxy, and the present board of directors, comprising a large majority of the former board, were unanimously elected.

This unusual and renewed mark of confidence from so large a body of the proprietors of the Erie Railway is justly due to the well-known character, capacity and integrity of my associates, many of whom, without any considerable pecuniary interest in this property, and all of them to the detriment of their own affairs, have been and are willing to give to me and to my administration much valuable time, for which assistance I owe them, collectively and individually, my hearty thanks.

The anomalous condition of this property, as above suggested, renders it proper that a more extended statement as to the general policy of the company should be communicated at this time to our stockholders than would be necessary if they were not, in so large a degree, resident abroad.

The Erie Railway originated in the necessities of commerce for increased facilities for transportation between the fruitful States of the great West and the port of New York, and the requirements for local transportation facilities. The same necessities now require, even more urgently, the earliest practicable completion of its double tracks, with the necessary equipment, depots, grain-elevators, coal-shutes, and largely increased terminal facilities.

The growth of the agricultural, mining and other industries of the Western and Middle States, and the expansion of the commerce between those States and the Atlantic seaports, and the manufacturing States of New England, have increased more rapidly than the means of transportation, and now imperatively require the extension of the Erie Railway, through appropriate connections, into the New England States and to the port of Boston.

Happily these requirements of commerce are not only consistent with but promotive of the interests of the stockholders of the Erie Railway Company; for the great accession of traffic which would be brought to the road, extended and improved as proposed, would yield far more than a proportionately increased net revenue, as the general expenditures of the company would be but little increased to do such increased business.

This railway was originally built by local subscriptions to the capital stock, by donations of lands for railway, depots and cross-tie and bridge timber, by free contributions by the State of New York of pecuniary aid, and by the sale of mortgage bonds.

The construction of the road was begun about the year 1835, and the actual money which has been faithfully expended in its construction since that time, with simple interest from the date of expenditure until now, amounts to more than \$150,000,000, while all the dividends paid to the stockholders, and simple interest thereon to the present time, amounts to less than \$17,000,000.

The evidences of these expenditures, to a large amount, were canceled on their voluntary surrender by the holders, in aid of the credit of the company, or by the sale and transfer, in 1862, of the original "New York & Erie Railroad Company," when it became bankrupt, to the Trustees who subsequently organized the "Erie Railway Company," the present corporation.

The present stock capital and bonded debt, aggregating less than \$125,000,000, represent therefore less than the actual cost and present value of the property.

The Erie Railway, from the rugged and sparsely settled country through which it ran, was exceedingly expensive to build, and, when built, it had to wait until its local business could be developed by the settlement and growth of the country. Moreover, like nearly all roads built under such difficulties, it was very imperfect in its construction and equipment, and consequently expensive to maintain and operate, and correspondingly crippled in its capacity for transportation.

These disadvantages, arising from imperfect and insufficient construction and equipment, the road would have overcome in time by the judicious application of its own earnings as they increased, and independent of extraneous aid, if it had not been compelled to contend with another and still more formidable difficulty in its exceptional six-foot gauge, nearly one-third wider than the general gauge of the country, which prevented all interchange of rolling-stock with other roads, and compelled the company at great expense to transfer all traffic into and from the narrow-gauge cars of its connecting lines, excepting only the case of the Atlantic & Great Western. Another and great disadvantage is the increased expense of working and maintaining a broad-gauge road by reason of the greater weight and bulk of its rolling stock, and the greater strain and wear and tear of both rolling stock and track.

The narrowing of gauge, reduction of grade and flattening of curves now in progress will, when complete, lessen the cost of transportation fully ten per cent.

In 1872, when the policy upon which the Erie road should be managed was under consideration by the American and English stockholders, two plans were prominently considered, viz: First, by as small an expenditure of money as possible to patch up the defects of the road and its equipment, and by strict economy and vigorous accountability make it earn the best dividend that could be extracted from it, which would necessarily be small.

This policy would leave the Erie road incapable of accommodating any considerable increase of business from the Atlantic & Great Western, the Lake Shore, and from the Canada roads and their western connections and extensions, thus not only restraining the development of the Erie road itself, but also limiting the amount of business which it would carry for its connections.

The only reason in favor of this plan was, that it dispensed with the necessity of raising additional capital.

The second plan was to expend upward of \$40,000,000 of additional capital in doubling the track of the Erie Railway, and supplying it with steel rails, narrowing its gauge, perfecting its road-bed, providing it with sufficient rolling stock and motive power, with grain elevators, coal shutes, and other depot and terminal facilities; extending its branches into the anthracite and bituminous coal fields; purchasing sufficient coal lands to prevent any hostile combination from diverting the coal trade from the Erie road; establishing its connections, through the New York, Boston & Montreal, and New York & New England railroads, with the great manufacturing districts of New England and their chief seaport, Boston, and with the Eastern railway lines which connect with those of the maritime British Provinces of New Brunswick and Nova Scotia, which terminate eastward at Halifax, the nearest seaport on this continent to

Europe, and the point at which multitudes of passengers for Europe who desire to make their ocean voyage the shortest possible will, at no distant day, embark and disembark.

While establishing these connections eastward, its alliance westward would be perfected so as to carry it practically to Cincinnati, St. Louis and Chicago, the three great gateways and depots of the commerce of the Southwest, the West, and the Northwest. The great traffic which, by these means, would be concentrated upon the main trunk of the Erie would be shared by its connections east and west, and all advantages would be reciprocal.

This second plan would place the Erie Railway upon a broad and permanent foundation of prosperity, and would also assure to it immediate and closely allied connections an equally prosperous future by sustaining to them the relation of trunk and root to branches.

Of the two plans, there was no question as to the expediency of adopting the second, the English stockholders having no doubt of our ability to borrow the additional capital needed, which, although in itself large, was small in comparison with the great magnitude of the resulting advantages, and the second plan was therefore adopted.

From this it follows, that the money arising from the sale of the last issue of convertible bonds has necessarily been applied to laying a foundation for earning dividends in the future, instead of aiming at immediate returns as contemplated by the first plan. The two plans are absolutely incompatible. The one sacrifices the immediate future, say from two to three years, to secure full dividends afterward, as the proprietor of a house sacrifices the rental while its rooms are under process of reconstruction, but expects to be reimbursed by the higher rental it will yield after a thorough reparation and refitting; while the other plan, by slight changes and patching, will secure an immediate but much smaller rental, and save the expense of thorough and complete fitting up.

A few persons have been so unreasonable as to expect to receive, immediately, all the net earnings that would have been practicable under the first plan, while adopting and carrying out the second.

No considerable dividend can be declared while the business of the road is, as now, impeded by reconstruction.

It is probably known to many of the stockholders of this company that shortly after I assumed the Presidency I made a communication to one of the prominent friends of the Erie road in London, Jas. McHenry, Esq., touching an extended system of roads then about to be brought into harmony with the Atlantic & Great Western Railway, with which last-mentioned road we now have only the same business connections that we have with all other friendly connecting lines.

So important do I consider one portion of this communication that I desire now to repeat it to the stockholders of this company, viz.:

"Apart from all questions as to the cost of transportation over broad-gauge lines in comparison with the narrow-gauge system, which last, for practical purposes, may be assumed to be of 4 feet 8 1/2 inches, I say, without discussing the comparative cost of transportation, though I believe that a narrow-gauge road may pay largely on its cost, while one of 6 feet may be worked without profit, it is plain to all those who have carefully considered the questions involved, that the inability to secure connections beyond Buffalo and Dayton for broad-gauge cars is alone a sufficient reason for urging a reduction of the gauge of both the Erie and Atlantic & Great Western lines to 4 feet 8 1/2 inches, and until this is accomplished the results anticipated by the owners of these roads cannot be secured.

"But having secured this change, or being assured that the means necessary for its accomplishment may be obtained in time to meet the requirements of the Erie Company, another question at once assumes equal or greater importance, and unless we are able, practically, to extend the Erie line to Cincinnati, and the Southwest, to the lake ports (including Chicago), to St. Louis and the West, and from Chicago to the Northwest, the Erie road will remain isolated from the main sources of profitable business, the absolute control of which at its source, freed from the caprices and changeable interests of the managers of other lines, is necessary to enable any trunk line to command, at all times, its due and proper share of the traffic which is abundant, but which has been unduly controlled, and has reached the sea-board by the Pennsylvania and New York Central lines.

"This far-reaching policy was first acted upon by the Pennsylvania road. In ten years it has by leases, running arrangements and the purchase of interests in Western lines, become the controlling power over many thousands of miles of railroads, so that its system has now become a network of connections between Canada on the north to the extremest western points of the United States, and all these lines of roads contribute constantly and surely to the business and profit of the original Pennsylvania road.

"At a later date the same system was adopted by Mr. Vanderbilt, and the influence of the New York Central road is now almost as powerful in the West as that of the Pennsylvania line.

"So far the Erie and Atlantic have been unable to compete with their rivals in this field.

"By the change of the direction of the Erie, it is now, for the first time, in a position to secure its share of this influence and business. If it fails now to secure similar advantages, it must remain, as in the past, comparatively powerless, and its future cannot be brilliant.

"In looking over the whole field of our Western connections, and of the main and constant sources from which our business springs, it seemed, at first, almost impossible to extend the influence of the Erie Railway in any direction without at once coming in contact and in conflict with the systems of the Pennsylvania and the New York Central roads, already established. One main line only, by its branches and leased roads, seemed to meet the requirements of the Erie Company, and was free from embarrassing contracts or alliances.

"This was the line of the Cleveland, Columbus, Cincinnati & Indianapolis Railway.

"This road runs from Cleveland to Columbus, 138 miles; at Galion, 30 miles from Cleveland, a branch runs to Indianapolis, 202 miles, and from the same point another branch extends to Springfield, 37 miles, thence by a leased line to Dayton, 25 miles, and thence by its own line to Marietta Junction, 48 miles, and to Cincinnati, 7 miles, by a leased line—all in the State of Ohio.

"On the north, from Indianapolis to Terre Haute (State of Indiana), 72 miles, the road is owned jointly with the Pennsylvania Company, and thence to St. Louis, 182 miles, over a road jointly leased by the Cleveland, Columbus, Cincinnati & Indianapolis and the Pennsylvania Central.

"It also controls by running arrangement the line from Beardstown on the Illinois River to Shawneetown on the Ohio River, a distance of 228 miles, passing through one of the most productive portions of Illinois.

"It owns a railroad extending from Union on the Indianapolis branch to Dayton on the Cincinnati branch, a distance of 48 miles, this branch being now used by the Pennsylvania road to make its Cincinnati connection from the West.

"It controls largely the business of the Tuscarawas Valley road, 95 miles in length, which crosses the Cleveland, Columbus, Cincinnati & Indianapolis at Grafton, and terminates on Lake Erie.

"These lines aggregate 1,139 miles, of which 559 miles are freehold, the remainder being leased on such advantageous terms that the leases alone are worth a large part of the present capital to any connecting trunk-line railway.

"The Cleveland, Columbus, Cincinnati & Indianapolis Railway makes a close connection with the Atlantic & Great Western at Cleveland, Springfield, Galion, and Dayton.

"The capital of the Cleveland, Columbus, Cincinnati & Indianapolis Railway is as follows:

Bonded debt	\$3,000,000
Shares	15,000,000
Surplus cash at end of last fiscal year	1,286,000
Surp us real estate	3,500,000
Other assets, as per schedule, exceed	1,000,000

"The shares of the Company have paid annual dividends of seven per cent, and upward from the time of the completion of the road, twenty years ago, to the present time.

"The railway, to a considerable extent, has been constructed from revenue. The 559 miles (freehold) represent a cost of only \$30,000 per mile, which would now scarcely pay for the rail and rolling stock. The large surplus real estate owned by the company is estimated to be worth more than sufficient to pay off its whole bonded debt.

"This railway can be controlled by the purchase of its stock in open market at from eighty to ninety per cent, of its par value, and never has any similar power over business been within the control of either of the trunk lines at so small a cost, nor where every dollar invested was in itself secure beyond peradventure, without regard to the incidental advantages arising from such a power."

Statement Showing Distances on Erie Railway, and Estimated Cost of necessary Improvements, and Extension of the Road and of its Equipment.

	Miles Single Track.
New York to Buffalo, 423 miles	846
Hornellsville to Salamanca, 82 miles	164
Salamanca to Dunkirk	46
Third track, Jersey City to Port Jervis, for light passenger traffic, to be laid with steel-top rail, taken from present track.	88
Total	1,144
Single rail, miles	2,328
2,119 miles steel rail 60 pounds per yard (equal to 47,143 tns per mile) equals 99,560 tons, which at \$130 per ton is \$12,647,920	
Less the use of 1,421 miles iron rail, 70 pounds per yard, 78,155 tons, at \$55 per ton, 4,208,595—\$7,649,395	
Laying track, spike, ties and ballast, on 1,056 miles, 3,210,249	
Widening roadway, tie and laying 88 miles third track, Jersey City to Port Jervis	2,014,000
Additional siding at various points along line	2,000,000
Grading and masonry	3,000,000
Iron bridges	1,000,000
New shop, grain elevators, depots, engine-houses, and impervious to stations	2,000,000
400 new locomotives at \$12,500	5,000,000
10,000 new freight-cars at \$750 each	7,500,000
Changing 11,000 cars from broad to narrow gauge, at \$100 each	1,100,000
Ex-digging road to Scranton coal field, so as to secure for transport 1,000,000 tons annually	3,000,000
Completing Hudson & Newark Railway and depots and is as for same on br ch	1,000,000
Purchasing car company interest in cars now in use, under contract	1,000,000
Total	\$39,79,635

It is understood that since the date of that letter, the absolute control of the Cleveland, Columbus, Cincinnati & Indianapolis Railway has been secured by those friendly to, or who control, the Atlantic & Great Western Railroad; and during the same period the control of the Lake Shore & Michigan Southern Railway, hitherto one of the most important connections of the Erie road, has passed under the control of the New York Central Railroad.

If the statements be confirmed, their importance can be hardly overestimated. The far-reaching and wise policy which, as stated in my letter to Mr. McHenry, has been pursued by the able managers of the New York Central and Pennsylvania companies has practically left open to us but one great line between the terminus of our road and the far West, and especially the Southwest. The only gap that is left through the lines of the Atlantic & Great Western and the Cleveland, Columbus, Cincinnati & Indianapolis roads and their immediate connections.

To deprive the Erie road of these connections and permit them to fall under the control of the New York Central Railroad would be to admit that the Erie was intended only as a local road, and that it was prepared to surrender its whole future prospects to those whose knowledge of the situation would enable them so easily to put an end to any considerable further increase of the influence and business of the Erie line.

In what manner these advantages may now be permanently secured to our line has hardly been discussed. Hitherto, any allusion by the officers of this road to such a comprehensive policy as governs the New York Central and the Pennsylvania lines, rivals not only for the business of our road but for that of the city of New York, has been met by insinuations and charges of speculation and corruption. So long as we carefully obey the law and perform our whole duty to our stockholders and the public, we may safely expect to be protected in the privileges which are accorded to other similarly situated roads. But I am of opinion that the time has now arrived when the plainest dictates of good sense will compel us to adopt the policy of the other trunk lines to protect ourselves against our rivals for our chief business, and without regard to false clamor from those ignorant of the facts or the willing tools of our opponents, we should freely, and with the full knowledge of our stockholders, discuss and determine, and then do what is necessary to enable us, beyond peradventure, to maintain an equality with our competitors.

I propose, therefore, with the sanction of the board, during my anticipated visit to England, to consult with the owners and bondholders of this company, and, having ascertained their views, I shall be ready, on my return, to recommend that line of action which seems to me most for the interest of the Erie road.

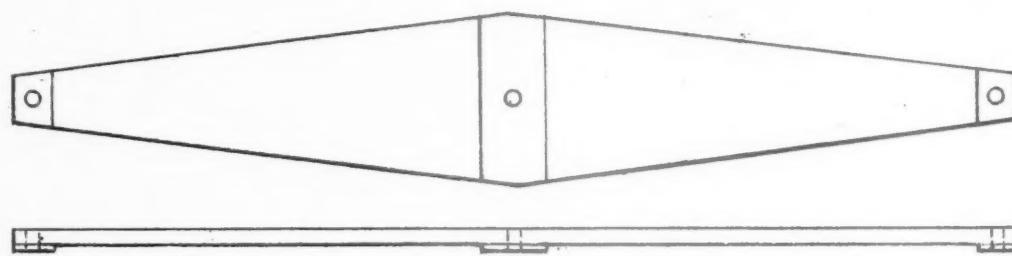
Of the means obtained by the negotiation of the recent issue of ten millions of convertible bonds, we shall expend a large portion during the year. But these expenditures have been, and for some time to come will be, chiefly made for grading for the double track; for purchase of rolling stock, rails, lands for roadway, depot, terminal and other facilities. These expenditures have, therefore, to this period, not only added nothing to the net income of the company's revenue, but have added to the current expenses, as interest on this large sum is charged to expense account.

In pursuance of my original plan, I propose to continue large further expenditures on the road; and I especially desire, at the earliest practicable period, to make large contracts for engines and cars to meet the sure and constantly increasing requirements of the road. For these purposes alone we shall need over \$8,000,000. To this end a further issue of \$10,000,000 of convertible bonds should be placed, as soon as our stockholders, to whom we must appeal for this assistance, are satisfied, as I am, that the credit of the road fully warrants this further call upon them for capital. I have no hesitation in urging this increase of the debt of the company, as I am confident that the consummation of our plans will place the Erie Railway on an equal basis with the most successful of the trunk lines, with an ability equal to theirs to earn and pay regular dividends.

The appended tables, prepared in the Accounting Department, present a statement of the company's affairs down to and including the 30th of June, 1873:

Table "A" shows the earnings for the nine months ending



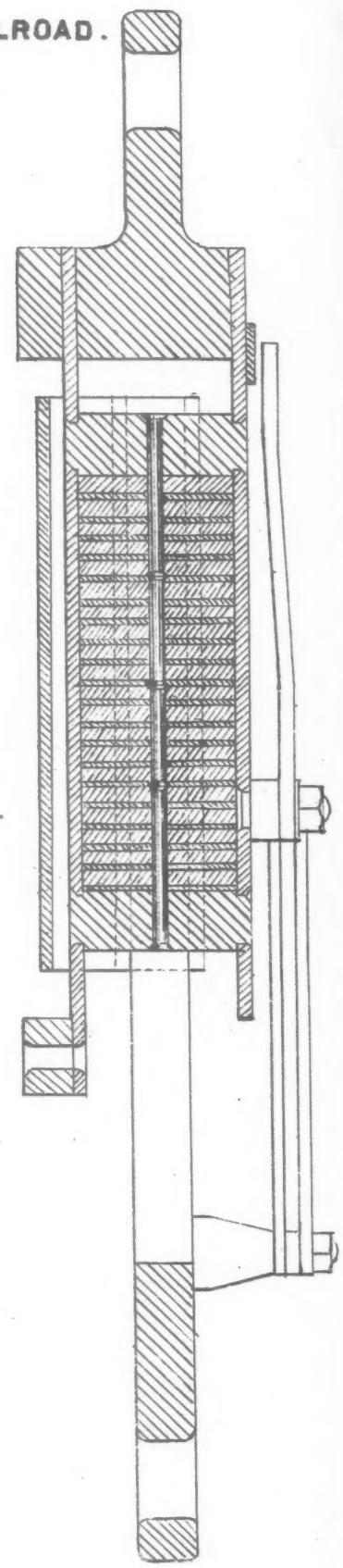
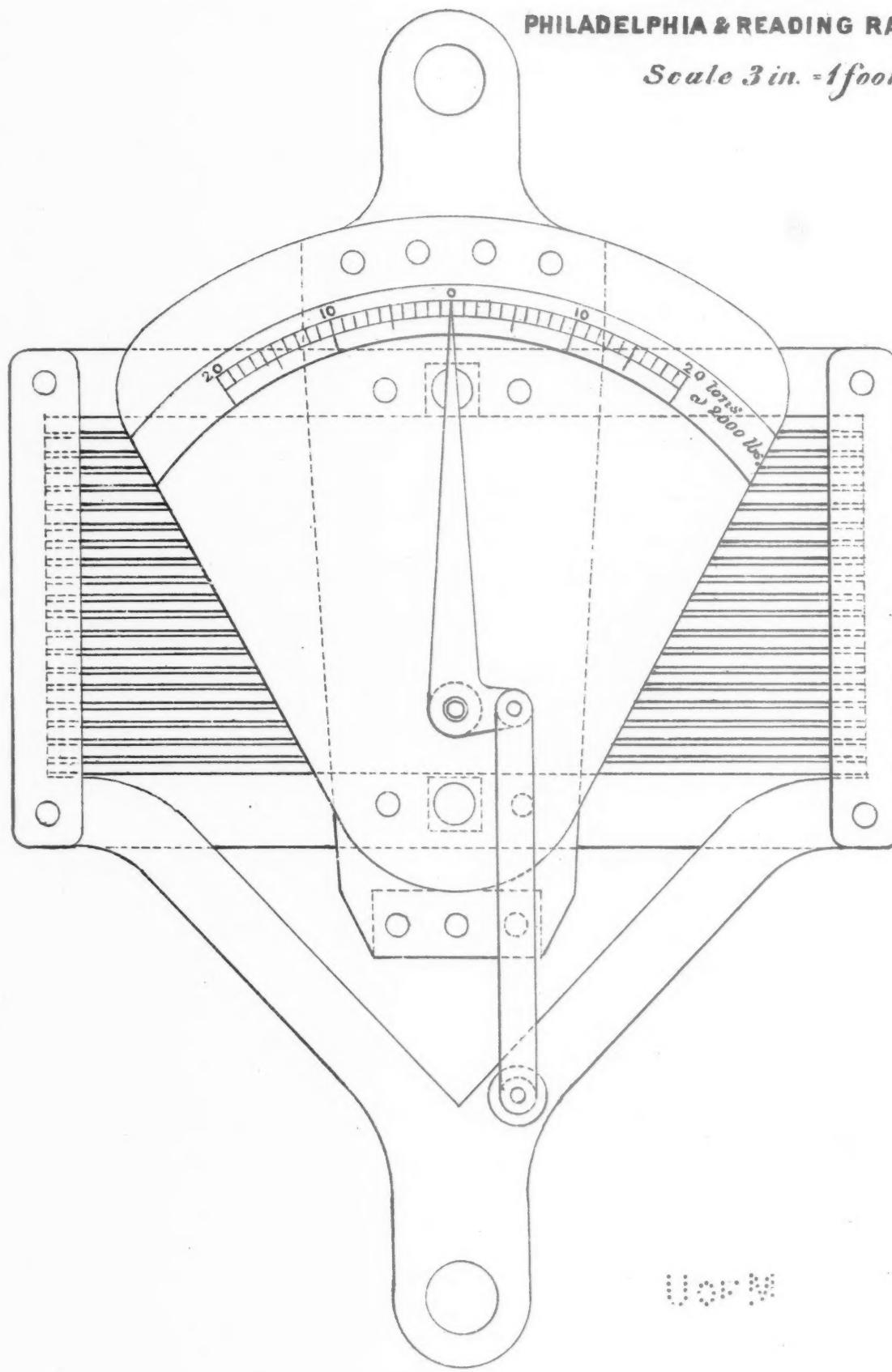


## DYNAMOMETER

used on the

PHILADELPHIA & READING RAILROAD.

Scale 3 in. = 1 foot.



U.S.P. 38

3

4



June 30, 1873, in comparison with the same period of the preceding fiscal year. It is shown that the earnings, in comparison with the same months last year, have increased \$1,085,573.51. The earnings from general freights have increased 11.53 per cent. From coal there has been a decrease of 3.89 per cent. From passengers there has been an increase 8.63 per cent. From mails and express there has been an increase of 14.47 per cent. From miscellaneous sources there has been an increase of 27.87 per cent. Making a net increase on the whole revenue of 8.07 per cent.

In arriving at the gross earnings of the road no account is made of the transportation of men or materials for the company; but, on the contrary, all items for such service are charged at their actual cost to expense account, and it will also be seen that we have recently renewed over 350 miles of single rail, replacing those worn out by steel or steel-headed rails, the total cost of which has been charged to account of current expenses.

Table "B" shows a comparative statement of the freight business during the nine months ending June 30, 1873 and 1872, respectively. It will be observed that the increased tonnage of paying freight has amounted to 250,419 tons carried.

In the change recently adopted in the distribution of freight at Jersey City, by the abandonment of an old contract and doing the work under the immediate supervision of the freight department, a large saving has been effected, sufficient, as appears by the results of the few months for which we have the data, to warrant this special notice of the fact.

Table "C" shows a comparative statement of the passenger business during the nine months ending June 30, 1873 and 1872, respectively.

Calculations in these tables are based upon the gross earnings of the Erie Railway and branches, which differs from the earnings as stated in table "A" in the amount of earnings refunded.

It is gratifying to state that these augmented revenues have been gained and the additional tonnage and passengers transported with an equal equipment of cars, as compared with the previous year, without any considerable additions of motive power, and without enlargements of terminal or other facilities.

At the same time, rival and connecting lines have made extended improvements in their receiving, transportation and delivering facilities, rendering increased effort and enterprise necessary to retain our traffic and overcome the growing force of their better accommodated, and consequently, more economically managed competition.

The results shown, therefore, indicate an improved standard of efficiency in the management of the various departments which is worthy of recognition. They also promise that more valuable results may reasonably be anticipated from all departments of the service upon the yet more efficient plan of organization recently adopted, and point directly to the largely increased traffic and greater proportion of net income which will surely result from the extensions, improvements and additions to the facilities of the company now in progress, and strengthen the argument for their speedy completion.

Table "D" shows a comparative statement of the working expenses of the Erie Railway Company for the nine months ending June 30, 1873 and 1872, also the amounts allotted to passenger and freight transportation respectively, and the percentage cost per train mile.

We have not charged to the expense account for operating the road during the six months ending June 30, 1873:

1. The cost of new construction by way of addition; this being charged to capital account.

2. The cost of reconstruction, to compensate the deficient reparation and replacement previous to 1872; this being charged to the debit of reclamations—a surplus account—such expenditures in the accounts of other railroads being usually and properly charged to the debit of the surplus account.

It will be observed that the working expenses have increased \$271,009.66, and that the earnings, as shown by table "A," have increased \$1,085,573.51, making a comparative increase in the profit of \$814,563.55.

Table "E" presents a statement of the earnings and expenses of the Erie Railway and its branch roads respectively, for the nine months ending June 30, 1873.

Tables "F" and "G" show an analytical statement of the mileage, revenue and expenses, and percentage cost charged to each department respectively. It will be observed that the working expenses have been 67.07 per cent. of the revenue.

Tables "H" and "I" show a statement of the liabilities and assets of the company, as also a statement of the profit and loss, or income account, as shown by the books, June 30, 1873.

Table "K" shows the Erie Railway and its leased lines and branches, the terms upon which they are operated, &c.

The certificates of the Third and Fourth Vice-Presidents for their respective departments, show that the road and its equipment have been maintained in good working order and repair, and that the cost of such repairs has been charged to the expense accounts.

It is proper, in our statement of accounts for this year, to advert briefly to the reclamations already made, and to those which we expect soon to secure from those persons who before the change in the management of the company in March, 1872, were connected with this road, or who had in some way, improperly, become possessed of the property of this company, or had failed to account for its property in their hands.

This account, as it now stands, shows a balance in favor of the company of \$8,312,380.02, consisting of real and personal property, worth to this company much more than their estimated values as they appear in this account.

Suits for other large amounts are already pending, and others are about to be commenced, from which the counsel of the company advise us that we may expect to recover in due course of law a very large sum of money and other property fraudulently diverted from the treasury of the company. No portion of this balance to the credit of the reclamation account has been carried to profit and loss; but the whole amount stands to the credit of the company, to be disposed of in the future as may be proper.

It has been a work of no little labor and difficulty, while investigating, correcting and posting the old accounts of the company, and establishing new systems and forms for greater security, to make out a statement of the affairs of the company to the 30th of June, 1873, the third statement of the kind which has been required during the first year of my presidency. The first was the report required by law to be returned to the Auditor of State up to the 30th September, 1872; the second up to the 31st December following, by which to determine whether any dividend was earned in the last six months of 1872; the third is the account up to the 30th June, 1873, appended to this report to determine whether a dividend can properly be declared from the net earnings of the company at this time.

In pursuance of the policy, already at different times explained to the directors of this company, and which has met their sanction, looking to the supply of coal for the use of the company, we have already established such relations with individuals and corporations owning coal lands, both bituminous and anthracite, as will, in my judgment, secure to us an ample provision in this respect for a long time to come, and will, incidentally, prove a very large source of revenue from transportation.

Much discussion has been had at different times in the past, both through the public press and in the Legislature of this State, as to the propriety of a general classification law, by which the periods of service of a portion of the directors of railroad companies might be extended, so that the shock of the whole policy and working system adopted by one board of

managers, consequent upon the election of an entirely new board, might be avoided.

Such a law was in force, and its provisions had been adopted by this company; but the just hostility of our stockholders to the special board thus organized was so great that, after a very long and serious struggle, in and out of the Legislature, the law, in so far as it affected this company, was repealed. I can not doubt that this repeal was equally a misfortune to the public and to our stockholders.

In its relation to the public, as well as to its connecting lines of railway, the true policy of a great railway line is of a delicate character, not readily learned nor easily changed without danger, both to the public and the owners of the road. With changes of management usually and naturally come changes in the whole working force of the road. Employees of all grades become accustomed to obey and to have confidence in those under whom they have served or to whom they owe their appointments; and any change in the management of such an extended and widely-ramified business may actually endanger the safety of the public for months after.

Confining the question to the interests of the stockholders, it is equally plain that frequent changes in the management lead to calamitous changes of policy, resulting from a want of the peculiar knowledge which can only be acquired through personal attention to the business of the company. The justice and wisdom of classification has been fully recognized by many of the States, including Wisconsin, Illinois, Indiana, Pennsylvania, Missouri and Ohio, all of which have classification laws, and even in New York the New York Central Railroad still has the right to classify its directors, and the advantages and justice of the principle is recognized in the charters of trust companies, banking institutions and religious corporations.

For these reasons I am of opinion that there can be no good reason for excluding the Erie Company from the beneficial operations of classification, and that a general law should be applied for at the coming session of our Legislature, under which a classification of the terms of service of directors would be permitted to this company.

During the past winter the propriety of the dividend then recently declared on the common stock of the company was seriously questioned, chiefly by those engaged in stock jobbing, and a committee of investigation was appointed by the Legislature of this State. A rigid investigation followed, occupying a number of months. Not only were the officers and employees of the company, and its books, vouchers and papers examined and carefully scrutinized, but hostile employees, who had been discharged for cause, were also examined, who testified to hearsay and suspicion.

The result was a complete vindication of our action by the able committee to whom this investigation was intrusted. But this examination caused a great loss to the company, as it compelled all the executive officers, as well as the chiefs of the Auditor's Department, to leave other employments and to devote themselves exclusively to this investigation for months, when other duties on the line of the road required their attention.

It is to be hoped that the exhaustive tables and extracts from our books, now published, will be satisfactory to all honest inquirers, and that we may be saved any further similar trouble, unless the inquiries are general in their character, and directed to all the railroads of the State, in pursuance of some well-considered plan of legislation.

In accordance with the reports of the General Auditor here with submitted, I recommend the declaration of a dividend of three and a half per cent. upon the par value of the preferred stock, and of one per cent. upon the common stock of the company, to be paid out of net earnings.

The amount suggested as a dividend upon the common stock might perhaps be a little increased, but I prefer to keep clearly within the limits of present actual earnings, trusting soon to show an increase that will warrant a larger distribution among the stockholders.

The net earnings since June 30, 1873, are more than sufficient to pay another dividend of three and one-half per cent. on the preferred stock.

I recommend a change of the periods for the paying of dividends. In accordance with the laws of this State, all of our accounts in the most complete detail, are made for the year terminating on the 30th of September. So long as this period of accounting remains unchanged, it is necessary, in order to save the labor of making intermediate statements, that the dividend periods should conform to it, and should follow the settlements of April and October.

Respectfully submitted,

P. H. WATSON, President.

NEW YORK, Sept. 2, 1873.

Table "A" is the following comparative statement for earnings for nine months ending June 30, 1873 and 1872:

	1873.	1872.	Increase.
Freight.	\$8,213,764 44	\$7,364,356 21	\$849,408 62
Coal.	2,852,171 86	2,967,737 90	-115,565 04
Passengers.	2,484,913 93	2,287,583 30	197,340 63
Mails and express.	638,244 05	537,559 69	80,684 43
Miscellaneous sources.	338,058 57	264,382 70	73,705 87
Total.	\$14,527,193 25	\$13,441,619 74	\$1,085,573 51
Not increase.			\$1,085,573 51

Decrease, \$115,566 04.

Table "B" gives a comparative statement of freight business during the nine months ending with June, 1872 and 1873. It gives for each month the tonnage, tonnage mileage and revenue of way freight east and west, and through freight east and west. It shows that that the number of tons carried in 1873 were 4,295,530, and in 1872, 4,015,111; increase, 250,419 tons—6.19 per cent. Number of tons carried one mile in 1873, 735,618,510; number of tons carried one mile in 1872, 702,449,424; increase, 33,169,086—4.72 per cent. Revenue, 1873, \$1,485,127,613 revenue, 1872, \$10,703,119.69; increase, \$779,007.92—7.27 per cent. Average number of tons each train, 96.94; average receipts per ton per mile, 1.56 cents.

Table "C" is a similar statement of the passenger business for the same period.

The number of passengers carried was 2,665,843 in 1873 and 2,527,869 in 1872, the increase being 5.45 per cent. This was equivalent to carrying one passenger 115,747,469 miles in 1873 and 109,876,610 in 1872, the increase being 5.31 per cent. The average receipts per passenger per mile were 2.23 cents in 1873 against 2.13 cents in 1872. The revenue from passengers was \$2,582,506.07 in 1873, against \$2,339,871.91 in 1872, showing an increase of \$242,634.16, or 10.37 per cent.

Table "D" is a comparative statement of the working expenses for the same periods. This is very elaborate, each item being allotted to passenger and freight transportation, and for train mile of passengers and freight trains. For the different departments the footings of the accounts are:

	1873.	1872.
General expenses.	\$519,512.04	\$61,994.74
Transportation department.	4,8,417.34	4,50,154.03
Road department.	2,58,173.30	2,616,352.81
Rolling stock department.	1,385,147.94	1,706,139.33
Total.	\$9,751,660.63	\$9,480,640.96
Increase (2.9 per cent.)		\$271,009.66

These expenses are shown to have been at the rate of 93.79 cents per train mile in 1873—90.73 cents per freight-train mile and \$1.1068 per passenger-train mile.

Table "E" is a statement of the earnings and expenses for the main line and branches, and is given below nearly in full:

Names.	Earnings.	Expenses.	Loss.
Erie Railway.	\$13,685,712 29	\$8,825,199.85	\$3,859,513
Newark & Hudson.	16,763 04	55,891 13	\$3,125,09
Paterson & Newark.	27,788 63	51,423 11	\$3,634 48
Hackensack & New York.	18,833 95	33,041 95	16,208 00
Hackensack & New York Ex-			
Tension.	16,979 41	34,264 37	17,284 96
Montgomery & Erie.	31,663 56	38,723 41	7,058 85
Goshen & Deckertown.	19,364 40	33,652 94	13,288 56
Hawley Branch.	265,396 45	131,861 36	...
Honesdale Branch.	24,423 93	51,456 64	23,029 71
Jefferson Branch.	11,020 06	237,452 70	146,432 64
Rochester & Genesee Valley.	108,737 00	112,028 51	3,293 51
Avon, Genesee & Mt. Morris.	27,394 60	46,171 30	18,776 70
Buffalo & Genesee Valley.	12,805 58	35,998 35	21,187 77
Buffalo, Bradford & Pittsburg.	7,184 10	56,496 42	49,306 38
Niagara Falls Branch.	65,669 60	18,627 66	12,955 96
Northern Railroad of N. J.	133,221 65	140,072 57	6,850 93
Total.	\$14,527,193 25	10,093,344 28	\$10,425 51

The profits on the Erie Railway were \$4,810,542.44; on the Hawley Branch, \$133,732.09; total, \$4,944,274.53. Net profit, \$4,433,849.02.

Table "F" is an analytical statement of mileage, revenue and expense.

Table "G" is a comparative statement of departmental expenses, and a statement of cost of road and equipment, the latter showing an increase of \$1,049,252.18 within the twelve months. It has also the certificates of the Third Vice-President and Superintendent of Road Department (Mr. James C. Clarke) as to the good maintenance of the road and fixed property and the fact that the cost thereof was charged to expense account, and a similar statement from the Fourth Vice-President (Mr. Henry Tyson) concerning the rolling stock.

Table "H" is the capital account, in which the liabilities are given as follows:

LIABILITIES.
Common stock.....
Preferred stock.....
First-mortgage bonds.....
Second-mortgage bonds.....
Third-mortgage bonds.....
Fourth-mortgage bonds.....
Fifth-mortgage bonds.....
Consolidated mortgage bonds.....
Sterling mortgage bonds.....
Convertible bonds.....
Buffalo Branch bonds.....
Rail estate bonds.....
Loans.....
Bills audited.....
Bills payable.....
Profit and loss.....
Total.....

To balance which the cost of road construction is given as \$109,856,939. The other chief items are \$2,941,781 in the bonds and \$5,396,410 in the stocks of the companies, \$2,017,765 for materials on hand, \$3,000,000 for real estate in New York, &c., \$1,559,510 balance of accounts receivable, and \$1,083,109 cash on hand.

Table "I" is the profit and loss account, and table "K" an elaborate statement of the main line and branches operated as parts thereof, giving length of each part and rentals of those leased, and a statement of length and terms of lease of all the other branches of whose earnings and expenses separate accounts are kept.

## General Railroad News.

### ELECTIONS AND APPOINTMENTS.

The executive officers of the New York & Oswego Midland Railroad are now as follows: General Superintendent, C. W. Douglas, No. 111 Liberty street, New York; Superintendent of Rolling Stock, W. H. Griggs, Oswego, N. Y.; Superintendent of Telegraph, Joseph Angell, New York; General Passenger Agent, William H. Weed, New York; General Freight Agent, H. M. Weed, New York; Superintendent New Jersey Division (Jersey City to Middletown, N. Y.); G. W. N. Cratiss, Jersey City, N. J.; Superintendent Middle Division (Middletown to Norwich); H. M. Flint, Middletown, N. Y.; Superintendent Western Division (Norwich to Oswego), W. P. McKinley, Oswego, N. Y.; Assistant Superintendent Western Division, F. L. Fouliques, Utica, N. Y.

Mr. T. B. Sargent, late Superintendent of the Boston, Barre & Gardner, has been appointed Superintendent of the Detroit & Bay City Railroad.

Mr. J. P. Woodbury, Assistant Superintendent of the Springfield, Athol & Northeastern road, has resigned that position and accepted an appointment as Assistant Superintendent of the Cincinnati, Sandusky & Cleveland Railroad.

Mr. R. H. Foster has been appointed General Ticket Agent at Boston for the Baltimore & Ohio road. Mr. Foster has been for some time Station Agent at Meriden, Conn., on the New York, New Haven & Hartford Railroad.

Mr. C. O. Whitney has been appointed Superintendent of the Northern Division of the Alabama & Chattanooga Railroad, in place of T. J. Carlile.

Mr. D. B. McCoy is Superintendent of the Ashtabula, Youngstown & Pittsburgh Railroad.

Mr. A. Craig Palmer has been appointed General Ticket Agent of the Cayuga Lake Railroad.

The officers of the Cazenovia & Canastota Railroad are as follows: President, S. F. Fairchild; Secretary and Treasurer, L. Fairchild; Superintendent, John Stebbins.

Mr. B. D. Townsend has been chosen President and Superintendent of the Cheraw & Darlington Railroad Company. His address is Society Hill, S. C.

Mr. H. H. Smith, late General Agent, has been appointed Assistant General Superintendent of the Detroit, Lansing & Lake Michigan Railroad, with office at Lansing, Mich. Mr. A. B. Crawford is Master of Transportation for the Eastern Division, and Mr. O. N. Hinkle, Master of Transportation for the Western Division.

Mr. William M. Hastings has been appointed General Freight Agent of the Fort Wayne, Jackson & Saginaw Railroad, with office at Jackson, Mich.

T. J. Brown, J. H. Britton, C. A. Andrews, J. A. Slater and Tom Richards, of Grayson County; H. B. Simonds, M. H. Wright and Fred Ende, of Hunt County, and T. M. Cain, of Raines County, as directors. T. J. Brown was elected President; H. B. Simonds, Vice-President; J. L. Randolph, Secretary, and Dr. J. H. Henry, Treasurer.

—Mr. George W. Melton has been chosen President of the King's Mountain Railroad Company, in place of W. E. Ross.

—The Fort Worth & Denver City Railroad Company was organized at Fort Worth, Tex., August 12, by the election of the following directors: W. A. Huffman, W. W. H. Lawrence, C. L. Frost, Jno. A. McKoy, J. M. Eddy, J. H. Creighton, D. C. Adams, Howard Schuyler and M. H. Goble. The board organized by electing J. M. Eddy President; W. W. H. Lawrence, Vice-President; M. H. Goble, Secretary, and C. L. Frost, Treasurer.

—Mr. Morris Tyler has been chosen President of the New Haven & Derby Railroad Company, in place of Henry S. Dawson.

—Mr. John B. Gallaway has been appointed Purchasing Agent of the Memphis & Charleston Railroad, with office at Memphis, Tenn.

—The directors of the Southern Pacific Railroad Company of California are as follows: C. P. Huntington, D. D. Colton, Robert Robinson, Charles Mayne, S. T. Gage, E. H. Miller, Jr., and J. L. Willcutt.

—The Arkansas, Shreveport & Texas Railroad Company was organized at Shreveport, La., August 21, by the election of the following directors: B. M. Johnson, B. Jacobs, R. H. Lindsay, R. D. Sale, A. H. Leonard, John D. Adams, Logan Roots, T. F. Dockery. The following officers were chosen: President, T. F. Dockery; Vice-President, B. M. Johnson; Secretary and Treasurer, S. B. McCutchen; Attorneys, Egan & Wise; Executive Committee, T. P. Dockery, B. M. Johnson, B. Jacobs, A. H. Leonard.

—Mr. E. S. Taylor has been appointed Superintendent of the Kent County Railroad, with office at Chestertown, Md., in place of C. H. Platt. Mr. George A. Rahm has been appointed Treasurer in place of R. Hynson. Mr. L. D. Pruyin, Smyrna, Del., is Chief Engineer.

—The latest list of officers of the Jacksonville, Pensacola & Mobile Railroad Company is as follows: President, M. S. Littlefield; Vice-President, Calvin Littlefield; Secretary and Treasurer, T. A. Byrnes, Tallahassee, Fla.; General Superintendent, Sherman Conant, Jacksonville, Fla.; Auditor and General Ticket Agent, James L. Taylor, Jacksonville, Fla.; General Agent, E. D. Woodruff, Philadelphia, Pa.

—Mr. Benjamin Thomas, of Port Jervis, N.Y., has been appointed Acting-Assistant Superintendent of the Delaware Division of the Erie Railway.

—Mr. George W. Cushing has been appointed Superintendent of Machinery of the Toledo, Wabash & Western Railway. Mr. Cushing was, until recently, Superintendent of Machinery of the Northern Pacific, and before that held the same office on the Kansas Pacific.

—At the annual meeting of the Cincinnati, Rockport & Southwestern Railway Company at Mount Vernon, Ind., August 26, the following board of directors was elected: S. S. L'Hommedien, John Shillito, Jacob Seasongood, Wm. Risor, K. Garard, Henry Lewis, T. H. Yeatman, James Kiwey, E. H. Sabin, L. Q. Deerwiller, John A. Mann, Milton N. Moore, J. L. Waters.

—Mr. R. A. Anderson has been appointed General Local Freight Agent of the Western & Atlantic Railroad, with office at Atlanta, Ga.

—Mr. T. C. Wales, Jr., has been appointed Eastern Freight Agent of the St. Louis, Kansas City & Northern Railway, with office at No. 317 Broadway, New York.

—Mr. J. C. Missimer is Superintendent of the Sterling Mountain Railroad.

—Mr. M. Stanton, formerly Assistant Superintendent of the Selma, Rome & Dalton Railroad, has been appointed Superintendent of the South & North Alabama Division of the Louisville & Nashville Railroad.

—Mr. Edward F. Folger has been appointed General Freight and Ticket Agent of the Richmond, York River & Chesapeake Railroad, with office at Richmond, Va.

—Mr. W. H. Conant has been appointed Treasurer of the Portland & Rochester Railroad Company, in place of G. P. Westcott.

—Mr. W. W. Dechert, formerly Resident Engineer of the Vera Cruz & Mexico Railway, and at one time (in 1856 and 1857) Vice-President of the Camden & Amboy Railroad Company, has been appointed Chief Engineer of the New York & White Plains Railroad, now under contract to be completed from Harlem River to New Haven within two years.

—The officers of the Wyandotte, Kansas City & Northwestern Railroad Company are as follows: President, F. C. Eames, Kansas City, Mo.; Vice-President and General Manager, Colonel C. Hulbert, Atlanta, Ga.; Secretary, T. J. Anders, Kansas City, Mo.; Treasurer, A. L. Harris, Kansas City, Mo.

—L. W. Towne, Assistant Superintendent of the Hannibal & St. Joseph Railroad, has been appointed Master Mechanic of the road to succeed his brother, H. A. Towne, who has gone to the Northern Pacific as Superintendent of Machinery.

—Mr. A. H. De Clercq, for several years past Master Mechanic of the Toledo, Peoria & Warsaw Railway, has resigned and is succeeded by Mr. W. O. Hewitt, heretofore foreman of shops at Peoria.

—Mr. H. C. Whiting has resigned his position as Master Carpenter of the Hannibal & St. Joseph Railroad to accept the position of General Manager of the Hannibal Car Works.

—General A. L. Russell, of Harrisburg, Pa., has been chosen President of the Allegheny Car & Transportation Company, whose works are being built at Braddock's Field, Pa.

—Mr. A. T. Sandford, formerly on the Vandia Division of the St. Louis, Vandalia & Terre Haute Railroad, has been appointed Master Mechanic of the Indianapolis & St. Louis Railroad, to succeed William Barker, resigned.

—At a meeting of the directors of the Lake Ontario Shore Railroad Company, Oswego, N. Y., August 27, Mr. J. G. Kellogg resigned his position both as President and director. Mr. Willis Phelps, of Springfield, Mass., was chosen a director to fill the vacancy, and the election of President was postponed till the next meeting.

—Mr. George U. Mayo has been appointed Assistant Superintendent of the Department of Road on the Erie Railway. He will have supervision of the Susquehanna Division, the Western Division and branches, the Buffalo Division and branches, and the Rochester Division and branches, with headquarters at Hornellsville, N. Y.

#### TRAFFIC AND EARNINGS.

—The earnings of the Great Western Railway of Canada for the week ending August 8 were: 1873, £20,193; 1872, £18,978; increase, £1,215, or 6% per cent.

—The earnings of the Grand Trunk Railway of Canada for the week ending August 9 were: 1873, £39,000; 1872, £34,300; increase, £4,700, or 13% per cent.

—The earnings of the St. Louis & Iron Mountain Railroad for

the second week in August were: 1873, \$56,520; 1872, \$49,323; increase, \$7,197, or 14% per cent.

—The earnings of the Kansas Pacific Railway for the third week in August were: passengers, \$28,058.07; freight, \$49,348.74; mails, \$2,055.31; total, \$79,462.12. Of this amount, \$3,645.24 was for transportation of troops, mails and Government freight.

—The earnings of the Erie Railway for the week ending August 23 were: 1873, \$479,287; 1872, \$449,302; increase, \$29,985, or 6% per cent.

—Hon. Lucius Robinson, formerly Comptroller of the State of New York, has been chosen First Vice-President of the Erie Railway Company.

—The earnings of the Burlington, Cedar Rapids & Minnesota Railroad for the third week in August were \$26,230.52.

—The earnings of the Indianapolis, Bloomington & Western Railway for the first three weeks in August were \$114,769.76.

—The earnings of the Columbus, Chicago & Indiana Central Railway for June were: 1873, \$89,649.99; 1872, \$85,245.67; increase, \$9,304.32, or 11% per cent.

—Mr. John W. Hobart, late General Freight Agent, has been appointed General Superintendent of the Vermont Central Railroad, in place of Mr. Gyles Merrill, resigned.

—The earnings of the Grand Trunk Railway of Canada, for the week ending August 16 were: 1873, £39,600; 1872, £35,900; increase, £3,700, or 10% per cent.

—The earnings of the Great Western Railway of Canada, for the week ending August 15 were: 1873, £20,775; 1872, £19,172; increase, £1,603, or 8% per cent.

#### CHICAGO RAILROAD NEWS.

##### Chicago & Northwestern—Madison Division.

Tunnel No. 3, on the Madison Division, near Sparta, Wis., will, it is expected, be completed and ready for the passage of trains by September 8. Through trains from Chicago to Winona by this line will be put on at once.

##### Michigan Central.

This company has a large force engaged in the construction of the second track, and by the 1st of October expects to have 30 miles completed since the opening of the season. It will then lack but 76 miles of two tracks between Chicago and Detroit. Grades have been so reduced between Lake Station and Michigan City that one-third more cars can be hauled in a train with the same power, and a similar improvement has been made near Ypsilanti.

Mr. H. E. Sargent, General Superintendent, has made the following new rules in regard to issuing free passes over that road:

—On and after September 1, 1873, trip passes will be issued by this company only as follows:

—First—By Assistant and Division Superintendents to employees of the company when traveling on the company's business. This kind of passes only will be honored to any point on main line or branches where necessarily given; beyond this superintendents of divisions will confine the issue of passes exclusively to their own divisions.

—Second—Superintendents of divisions are permitted to issue passes over their own divisions in limited numbers to employees, or their wives and children, in the case of such employees as are especially deserving on the grounds of long and faithful service with the company, but they will decline to issue passes to any who are not thus deserving.

—Third—Applicant for passes from the superintendents of connecting roads, with which this company is doing business, in favor of their employees, may be honored by division superintendents; but passes for the wives or families of the employees of other roads will in no case be given, nor will such passes be asked for by the officers of this road.

—Fourth—The superintendents of telegraph, locomotive and car departments, and all road-masters will issue passes to employees in their several departments when traveling on the company's business only, or to and from their homes.

—Fifth—The Chief Engineer will issue passes in furtherance of the business of his department.

—Sixth—The General Freight and General Ticket Agents will issue passes only to the clerks and employees in their departments, when having occasion to travel on the company's business.

—Seventh—The practice of competing roads and lines will govern us with reference to the issue of passes to shippers of live-stock, and such passes will only be issued by the General and Assistant General, and Division Superintendents, and General Freight Agent.

—Eighth—All other applications for passes must be referred to the General Superintendent, or to the Assistant General Superintendent.

—Ninth—No general letters will be given by any officer of this company, asking passes of whom it may concern, &c., and no attention will be given to such letters presented to us.

—Direct applications for passes from the Presidents, General Superintendents, or Assistant General Superintendents of other roads, addressed to the same officers of this company, will receive such response as our rules will permit.

—All passes must specify in full the reasons for which they are given.

##### Pullman Palace Car Company.

This company has again earned the benedictions of its customers by ordering its conductors to exclude all peddlers from its cars, except at the request of passengers.

##### Chicago & Northwestern.

The Madison Extension will soon be completed, the work on the last tunnel near Sparta, Wisconsin, being nearly done. An excursion party will leave Chicago some time this month to celebrate the completion of a through line 620 miles in length from this city to Lake Kampska, in Dakota. This company has been receiving during the past two weeks a daily average of about 600 car-loads of grain.

##### Chicago, Omaha & St. Joseph.

Preliminary arrangements have been made whereby it is expected that several million of the bonds of this company will soon be sold and the road be got in progress of construction.

##### Illinois Central.

On Saturday this road received 540 loaded cars in Chicago, including 152 loaded with wheat, 165 loaded with corn, 46 with other grain, and the remainder with coal and general merchandise. The company at the present time ships about 25 car-loads of coal per day into Cairo, and about 25 car-loads of general merchandise. The wheat from Iowa, which a few weeks ago, was almost entirely diverted from Chicago, at Freeport, after passing over the Iowa division, is now almost all brought to Chicago. This company, as well as every other one entering Chicago, has had more freight offered within the past two weeks than it could move. The high prices of grain and the low freights have combined to bring to Chicago such an avalanche of grain as has never before been equalled. Some 1,400 car-loads have arrived in this city each day for the past two weeks. Nobody has objected to the new railroad law since this state of things has existed. It should be remembered, however, that about three empty cars return to the country from Chicago to every one that is loaded. On Sunday, August

31, several changes were made in the time-tables of this road. The day express for Cairo and St. Louis leaves Chicago at 8:25 a.m. The night express for Cairo will leave Chicago, Saturday excepted, at 8:15 p.m. The Gilman passenger train leaves, Sunday excepted, at 5:15 p.m. The day express from Cairo and St. Louis will arrive at 8:50 p.m. All Hyde Park trains run as at present, except the Sunday noon train, which will leave at 12:40 p.m.

##### Chicago & Pacific.

This company is grading its road from its present terminus about two miles from Elgin, to that city, and expects to be able to run cars into the city some time during the month of September.

##### Chicago, Pekin & Southwestern.

Trains are now run over this road between Chicago and Peoria. The through trains run to Streator over the Chicago, Burlington & Quincy and its Fox River Branch, thence to Pekin over the Chicago, Pekin & Southwestern, and thence to Peoria over the Peoria & Springfield. The distance by this line from Chicago to Peoria is 172 miles, against 160 by the Chicago, Rock Island & Pacific.

The through train leaves Chicago at 7:30 a.m. and reaches Peoria 4:35 p.m.; returning it arrives in Chicago at 8 p.m.

##### Pittsburgh, Fort Wayne & Chicago.

This company has fitted up its ticket office in Ashland Block, on the corner of Clark and Randolph streets, in a magnificent style, described thus by the *Inter Ocean*: "The floor is laid with the Minturn tile, inlaid with mosaic work. Two crystal chandeliers, with prismatic pendants, hang in the center of the room, while stork standards and brackets, with globes of exquisite workmanship to match, are ranged about the room. The ticket case is a fine piece of railway office furniture, manufactured of black walnut inlaid with veneer red French walnut. The masterpiece in the office is the counter, which is made of the finest solid black walnut, set with French walnut and butternut, a combination of colors which gives it an attractive appearance. The top is made of the finest polished Lisbon marble, of a mottled hue, which was manufactured at the company's shops at Fort Wayne. Around the base of the counters the entire length is placed a silver-plated railing to protect the wood work. The ceiling of the office is finely frescoed. The offices above, which are occupied by Mr. W. C. Cleland, the General Western Passenger Agent, are fitted up in a corresponding fine style. This is the finest railroad office in the city."

This company has reconstructed its suburban time-table. The trains commenced to run September 1 as follows: leave the Madison street station at 6:20, 8 and 10 a.m., and 12:01, 2:15, and 5 and 6:15 o'clock p.m. They all stop at the Stock Yards, except the 8 a.m. and 5 p.m. trains. On return, the trains leave Englewood at 6:20, 7:30 and 9:20 o'clock a.m., not stopping at the Stock Yards. The trains leave the Stock Yards at 11 o'clock a.m. and 1:20, 3:40 and 6:10 o'clock p.m. On Sunday, the trains going south leave Madison street at 10:15 a.m. and 1:05, 3:25 and 5:55 p.m. Returning, they leave Englewood, stopping at the Stock Yards, at 9 and 11:58 a.m. and 2:20 and 4:40 p.m.

##### The Arrest of Beane.

Edward Beane, the conductor whose disobedience of orders caused the terrible and fatal collision near Lemont on the Chicago & Alton Railroad, on the 16th ult., for whose apprehension the company offered a reward of \$1,000, was discovered about twelve o'clock on the night of the 27th ult. It is reported that he says that he "forgot" that he was running on the passenger train's time until immediately before the collision; that he then called to the brakeman to put on brakes, and that while they were being put on the collision occurred. It has been reported that the man hid away for fear of mob violence, and did not intend to avoid arrest ultimately, but only kept it off until the public feeling against him had somewhat subsided. If this was his object it was quite successful; for, now that he is in jail, a great deal of sympathy is expressed for him, probably the more because the man who hunted him up and received the reward for apprehending him was an old friend.

#### THE SCRAP HEAP.

##### Prizes at Vienna.

A complete list of the prizes awarded to Americans at the Vienna Exhibition has been published. Among them are the following: The highest distinction, the "grand diploma of honor," was given to William Sellers & Co., of Philadelphia, for a puddling furnace and machine tools, and to Corliss, of New York, for perfection in steam engines. Four others were in the Department of Education, one for resiping and mowing machines, and the other for dental instruments and artificial teeth.

The "medal of progress," which indicates that the Exhibition has produced some valuable design or invention since the Paris Exposition of 1867, was granted to 58 American exhibitors, among them the following: Billings & Spencer, Manufacturing Co., Hartford, Conn., drop forgings of wrought iron and steel for machinery generally; Pickering & Davis, Portland, Conn., steam engine and regulators; Baxter D. Whitney, Winooski, Mass., band-saw machine; Brown & Sharpe Manufacturing Co., Providence, R. I., milling machines; B. C. Tighman, Philadelphia, sand blast; Knapp Dovetailing Machine Co., Northampton, Mass., dovetailing machine; N. & B. Douglas, Middletown, Conn., hydraulic pumps; Morse Twist Drill Co., New Bedford, Mass., drills; John Stephenson & Co., New York, street cars; Lewis Miller, Akron, Ohio, automatic dynamometer; Fairbanks & Co., New York, scales.

The "medal of merit" was given to about 150 American exhibitors, and among them to the Joseph Dixon Crucible Co., Jersey City; one for American graphite, and one for graphite, to P. Rothwell, mining engineer, New York, for Alabama iron ores and coal; the Northern Pacific Railroad Company, one for geological specimens, and one for grains, fruits, woods, ores, etc.; F. S. Pease, Buffalo, N. Y., for oils; Buckhardt & Co., Cincinnati, double-refined lard oil; Gest & Atkinson, Cincinnati, oils; Eclipse Lubricating Oil Co., New York, oils; J. McDermott & Co., Cleveland, Ohio, grindstones; Theo. Berquer, Philadelphia, mechanical drawing apparatus; Norwalk Iron Works, Norwalk, Conn., steam engine; J. A. Fay & Co., scroll sawing, mortising, boring and other wood-working machines; William Sellers & Co., Philadelphia, iron-working machinery; Wetherby, Rugg & Richardson, Worcester, Mass., planing and grooving machine; Richards, London & Kelly, Philadelphia, sawing machinery; Stiles & Parker Press Company, Middlebury, Conn., purchasing press; C. B. Rogers & Co., Norwich, Conn., planing and matching machines; Jones & Langhlin, Pittsburgh, shafting; Ramapo Wheel and Foundry Company, Ramapo, N. Y., car wheels and iron ores; Charles Underhill, Tolland, Conn., belting; Darling, Brown & Sharpe, Providence, R. I., instruments for measuring; General John Newton, United States Corps of Engineers, method of blasting rocks; Charles Churchill, New York, Stevens' patent parallel vice. The "diploma of recognition," which is something like the "honorable mention" of our fairs, was awarded to something more than 100 American exhibitors, and among them to J. B. Hoyt & Co., New York, for belting; W. B. Sherman, Boston, for spades and shovels; Walton Bros., Newark, N. J., for conductors' lanterns; J. E. Mitchell, Philadelphia, for grindstones; Pratt & Whitney Manufacturing Co., Hartford, Conn., milling machines, drills, spindles, etc.; Charles Churchill, New York, drilling machines;

Adam Carr, New York, danger pump for mines; George R. Boomer, Syracuse, N. Y., hydraulic presses; Nathan & Dreyfus, New York, oil cups, etc.; Pitkin Bros., Hartford, Conn., tubular steam boiler; Charles H. Baker, Philadelphia, self-gauging tynes; Hubbard & Curtis Manufacturing Co., Middletown, Conn., drill chucks; E. Horton & Co., Windsor Locks, Conn., lathe chucks for boring; Vose, Dinsmore & Co., New York, car springs; Wm. F. Caston, New York, telegraphic night signals for vessels; Theodore Bergen, Philadelphia, drawing apparatus; New York Safety Steam Power Co., vertical steam engines; Louis W. Leeds, New York, designs for ventilation and heating.

#### Railroad Manufactures.

The Grant Locomotive Works at Paterson, N. J., completed 15 engines during the month of August, making 97 engines completed during the eight months ending August 31.

During the month of August 39 locomotives were shipped from Paterson over the Erie Railway by the three shops located in that city.

The American Paper Car Wheel Manufacturing Company has begun to put up buildings at Hudson, N. Y.

#### OLD AND NEW ROADS.

##### Pennsylvania—New York Division.

The new freight track from the east end of Bergen Cut to the Harsimus docks has been completed. The track leaves the old road some 200 yards west of the signal house at the east end of the cut, turns northward by a sharp curve, then eastward by a second short curve and runs straight across Jersey City to the docks. It is carried through the city on trestle work, with bridges at the street crossings. It is about a mile and a half long.

The main freight building now being built at the docks is a frame building constructed in two portions, the northern of which will be 800 feet in length by 60 feet in width, while the southern portion will be 900 feet in length by 80 feet in width. Each of these portions will be covered with a hip roof of slate, the highest point of which will be 30 feet from the ground, the springing line being 16 feet lower down. This building will be inclosed on the outside only, as between the two portions there will be no wall. The sides of the building will be divided into spaces of 16 feet each, these spaces on the north side being occupied alternately by windows and doors, while on the south side there will be a window and door in each space. At the height of the springing line, between the two roofs, will be a very large gutter, with which, at every column, large leaders will run. The eaves pipes have been made very large—12 by 14 inches—so as to facilitate the carrying off of any amount of snow which may accumulate on the roof in winter.

Extending forward from the front of the southern portion of the building is a grain pier, 800 feet long by 65 feet wide, which will in time be placed under cover. South of the grain pier large ferry slips are being built, from which cars will be carried upon floats for transportation to New York. North of the pier a channel, 200 feet wide and 30 feet deep at high water, is being excavated by Messrs. Morris & Cummings for the company. Still further north another pier of about the same size is to be built.

Some trouble has arisen with the authorities of Jersey City about the street obstructed by the construction of the new depot. The company represent that when they became proprietors of the shore front there was no street laid out, and they reclaimed the present streets by filling in the river.

The widening of Bergen Cut for the third track is progressing as rapidly as possible. The cutting is through very hard rock, and retaining walls have to be built in those places where there is earth cutting, while the constant passage of trains hinders the work.

The new shops at Meadow Turnout are making rapid progress. The foundations of the freight repair shop, which is to be circular and some 400 feet in diameter, are laid. The passenger-car shop is nearly complete, and the machine and locomotive erecting shops lack only the windows. The round-house is nearly ready for use.

##### Tennessee Central.

This company has concluded a contract with the Northwestern Construction Company, of Illinois, for the grading, bridging, log-drains, culverts, cross-ties, etc., on the portion of the road extending from Huntingdon, by way of McMinnville, Milan and Trenton to Brazil. The road-bed is to be ready for the reception of the iron rails to Milan by the 1st of April, to Trenton by the 1st of July, and to Brazil by the 1st of September, 1874. The contract was signed August 21. The distance from Huntingdon to Brazil is 41 miles. Huntingdon is on the Nashville, Chattanooga & St. Louis road, 107 miles northwest of Nashville. The road is intended to run through to Fulton, on the Mississippi, 56 miles beyond Brazil.

##### Chicago & Atlantic.

At the annual meeting of this company at Huntington, Ind., August 9, the final arrangements for the construction of the road were agreed upon with the Construction Company and the Financial Agent of the road, Mr. Alfred C. Garcia, of New York. The contractor for the grading is Mr. Wm. Miller.

A correspondent informs us that work has been commenced by the contractor on the section from Marion, Ohio, west to Kenton, about 23 miles. Several hundred men are already at work, and it is expected that this section will be ready for the iron by October 15.

##### Cairo & Fulton.

This road was completed to Fulton, Ark., on Red River, August 30. Fulton is 125 miles southwest of Little Rock and 33 miles beyond the Little Missouri River, the last point noted. Grading between Fulton and Texarkana is progressing rapidly.

##### Atlantic & Richmond Air Line.

It is stated that tracklaying is completed on the gap in this line, which by our last reports extended from the end of the track 86 miles northeast of Atlanta to the Saluda River, eight miles west of Greenville, S. C., a distance of about 69 miles. A train passed through from Charlotte, N. C., to Atlanta, Ga., August 26. The whole length of the road from Charlotte to Atlanta is 263 miles and it completes the Southern Security Company's line from Richmond to Atlanta.

##### New York & Oswego Midland.

The repair shops for the Eastern and Middle divisions are to be located in Middletown, N. Y., near the Wickham Avenue Depot. The cost of these shops is expected to be about \$80,000 and of the tools about \$30,000. A recent number of the Middletown *Press* describes these shops as follows:

"The site comprises thirty acres of level meadow land now owned by H. R. Low, who also owns other lands adjoining. The grounds will require little grading, but will probably need both filling and draining. There will be about a dozen buildings, the three largest of which will be situated as follows: The round-house will be nearest the depot, and will occupy the corner made by the railroad and the street. East of this on the avenue will be the engine and car shop, with other smaller structures; and north of these along the track will be the car-house, a round building for sheltering cars.

"The dimensions of the buildings are as follows: The round-house is 236 feet in diameter and 17 feet to the eaves. It will have 40 stalls for as many locomotives. The wood shop, for building and repairing cars, is 90x150 feet and one story high.

The machine shop proper, for erecting and repairing engines, is 90x200 feet, and will have ten pits for locomotives. In front of this is the transfer-table, by means of which engines are set into the pits. It is 35x165 feet. In the rear of the wood and machine shops is the blacksmith shop, which is 50x115 feet, and will contain a large number of forges. In front of them is the store-house for supplies, which is 50x70 feet, and two stories high. The car-house is 316 feet in diameter, and is divided into 40 stalls, with a turn-table in the center for distributing the cars.

"The other buildings are: a brass foundry, 32x50 feet; a boiler shop, 50x70 feet; a house for the boiler and engine that are to furnish steam and power for the entire works, each to be 25x25 feet; and the coal sheds, 40x200 feet. All the buildings are to be of wood, and roofed with tin. Those that are exposed to danger from fire will be lined with brick to the height of five feet. The plans and specifications for the shops were made by the Master Mechanic, Mr. W. H. Griggs, who built the principal works of the Rome, Watertown & Ogdensburg, and of the New London, Willimantic & Palmer railroads. The ground will be staked out Monday next, and the work of erecting the shops will commence immediately."

##### Green Bay & Lake Pepin.

A special meeting of the stockholders was to have been held in Green Bay, Wis., September 5, for the purpose of considering and determining as to a change of the corporate name of the company.

##### Pennsylvania.

A Pittsburgh paper of recent date says:

"Two gangs of men are working night and day on the tunnel which the Pennsylvania Railroad Company is excavating at Port Perry, twelve miles up the Monongahela. This tunnel and the bridge they are building across the river at that point will give their main line connection with the Pittsburgh, Virginia & Charleston railroad, now being extended along the left bank of the river. The tunnel will be about 500 feet in length, and the bridge will be an elegant and substantial iron structure, costing about \$500,000. The distance from Port Perry, on the left bank of the river, to the point of connection with the Pennsylvania, east of Brinton, is about one mile, and from the point of connection with the Pittsburgh, Virginia & Charleston road to the South Side depot, in this city, of the Pan Handle road about twelve miles. The tracks of the Pittsburgh, Virginia & Charleston road between this city and the connection opposite Port Perry will be used by the Pennsylvania Railroad Company for moving all through freight transported via the Pan Handle road, thus avoiding the jam and delay that always occur at the Union depot in busy seasons."

##### New York & White Plains.

This company is preparing to construct a railroad from opposite the head of Second avenue, New York, on the Harlem River in Westchester County, to New Haven, Conn., with a branch in Connecticut from Milford to Derby, where it will connect with the Derby Railroad, giving an alternative route to New Haven for this part of the distance. The surveys have been made and the contract for the construction let to D. N. Stanton, of Exchange court, New York, who constructed the Alabama & Chattanooga Railroad; A. P. Bach, of Hanover, N. H., a wealthy and experienced contractor. They agree to complete the entire line to New Haven by July, 1875.

The route of the road is from the Harlem River at Second avenue, crossing under the New York & New Haven Railroad at Mount Vernon, thence to Pelhamville, thence, under the charter of the Rye & Westchester Railroad Company to the village of Port Chester; and thence, under the charter of the New York & Eastern Railroad Company, to New Haven.

We are informed that large subscriptions to the stock of the company have already been made by the people on the line of the road, whose land would doubtless be enormously increased in value by giving it a quick route to New York.

At first the company purposed to give access to the lower part of the city by steamers on the East River, but if the Gilbert Elevated Railroad Company constructs a line in Second avenue, it will run its cars over that. Our informant says that the contract has been made on terms which the company is fully prepared to meet, and that no failure or delay can result through its fault. Mr. W. W. Dechert, a well-known and experienced engineer, is chief engineer for the company.

##### Wyandotte, Kansas City & Northwestern.

The line of this projected road extends from Kansas City, Mo., nearly due east through the counties of Jackson, Lafayette, Saline, Howard, Boone, Callaway, Montgomery, Warren, St. Charles and St. Louis to St. Louis, a distance of about 240 miles. The line is about half way between and nearly parallel to the Missouri Pacific and St. Louis, Kansas City & Northern roads. The company has had subsidies voted by Jackson County of \$250,000 and by Saline County of \$125,000. The road is to be of three-foot gauge.

##### Toledo, Wabash & Western.

The rates reported last week from Springfield, Ill., to New York, over this road, should have been, of course, for the other direction—from New York to Springfield.

There has been a sharp contest to secure control of the stock for the election which is to take place October 1, apparently between the Canada Southern interest, which now has a majority of the board, and the Lake Shore & Michigan Southern, which prefers not to lose the through traffic contributed by the Wabash's great system of lines if it can help it. Books were advertised to close September 4, but it is said that the voting of shares transferred after the 1st will be contested, on the ground that the laws of Ohio require that the stock shall have been at least for 30 days in the name of the party voting before the election. No reports have been made as to the probable result of the election. It will be harder for the Canada Southern than for the Lake Shore to lose the election, as the latter has plenty of traffic without that of the Wabash, while the Canada Southern can hardly have any other feeder until its own line to Chicago is constructed, and moreover has very little local traffic to support it, and meanwhile the interest on its debt must be paid.

##### Arkansas Valley & Cimarron.

The Cimarron (New Mexico) *News* of recent date says: "Mr. Morley, Vice-President and Executive Officer of the Maxwell Land Grant and Railway Company, left last Tuesday evening for New York, where he expects to meet a commission sent out from Holland to consult regarding the Arkansas Valley & Cimarron Railway. These gentlemen represent a large amount of capital, and only wait to thoroughly understand the railroad prospects to invest it. The party proceed to Boston, and will no doubt consummate arrangements with the Atchison, Topeka & Santa Fe Company to push forward the road at an early date."

##### Ways River.

The track on the extension to Winchendon is now laid 16 miles north of the old terminus at Gilbertville, Mass., and nine miles beyond Barre Plains, the last point noted. Regular trains have commenced running to Barre Plains.

##### The Union Pacific Suits.

A recent Washington dispatch says: "A motion will be argued early in September, before Judges Hunt and Woodruff, to dismiss, for want of jurisdiction, the suit of the United States against the Union Pacific Railway and Credit Mobilier of America. Each of the very numerous defendants will have the right to make motion by separate counsel; but Judge Benjamin R. Curtis, of Massachusetts, counsel for several of the

most largely interested, will represent all in the single test case, while the principal argument on behalf of the suit and of the government will be made by Judge Aaron Perry, of Cincinnati. It is intimated that influences are at work, and will soon be put in more active motion, to secure legislation in the next Congress which will cause an early abandonment of the suit, a task which will have some difficulties."

##### New Orleans, Mobile & Texas.

It having been reported that Mr. Charles Morgan had made proposals to this company that under certain conditions he would complete their Texas line, the statement has been denied explicitly and by authority of Mr. Morgan.

##### Houston & Texas Central.

Much complaint is made of the high rates of freight charged by this company, and it is urged that business is being driven away from the road.

##### The Houston (Tex.) *Age* says:

"An item of interest and serious moment to our business community may be found in the fact that Fort Worth merchants are having their goods from Denison to that point shipped by wagon, a distance of ninety miles, rather than by the Central road to Dallas, and thence to Fort Worth, a distance of only thirty-six miles. These goods are from St. Louis."

##### Northwestern Union.

This company is making extensive yards at Milwaukee. A large freight depot is to be put up, with a grain elevator and warehouse. The road to Fond du Lac is being ballasted and new depot buildings are going up all along the line.

##### International & Great Northern.

On the extension of the International from the Brazos River southwest into Milam County, Tex., 15 miles are graded and work has commenced on the other 10 miles. A temporary bridge over the Brazos is nearly completed. Tracklaying will begin as soon as trains can cross the bridge.

##### Ohio & Mississippi.

It is stated that this company has closed negotiations by which it will secure a line from Cincinnati to Chicago. It is understood that the Whitewater Valley road from North Bend, O., northwestward to Hagerstown, Ind., will form a part of the line.

##### Central of New Jersey.

Negotiations are going on with the authorities of Plainfield, N. J., for the lowering of the streets of that town at several points and the building of bridges over them, so as to avoid all grade crossings of the railroad as far as possible.

##### Fort Worth & Denver City.

This company was organized at Fort Worth, Tex., August 12. The road is to run from Fort Worth northwest through the "Pan-handle" of Texas and New Mexico to Denver, Colorado.

##### Henderson, Tyler & Sherman.

This company was organized at Sherman, Tex., August 23, by the election of officers. The road is to extend from Sherman, Tex., southeast through Tyler to Henderson, a distance of about 200 miles. The company has a charter, and, we believe, a land grant from the State.

##### Martinsburg & Potowmack.

This road is now nearly completed, and it is expected will be opened about September 10. Its completion will extend the main line of the Cumberland Valley to Martinsburg, West Va., 94 miles from Harrisburg, Pa., the northeastern terminus.

##### Washington City, Virginia Midland & Great Southern.

The directors of this company, at a meeting held in Alexandria, Aug. 19, unanimously voted to ratify the agreement for the lease to the Baltimore & Ohio Company of the section of the Manassas Division from Strasburg, Va., south to Harrisonburg, 50 miles.

##### Chester Gap.

The surveys of this projected road, which is to extend from Gordonsville, Va., the junction of the Chesapeake & Ohio and Washington City, Virginia Midland & Great Southern, northward to Fort Royal, about 60 miles, are shortly to be commenced.

##### Union Pacific.

The *Omaha (Neb.) Herald* of August 27 states that the plans for the new depot and offices at that place have been approved and orders given to advertise for proposals for the required material at once.

##### Pittsburgh, Cincinnati & St. Louis.

This company is laying the whole track on the eastern section of the Second Division from Bradford Junction, O., to Logansport, Ind. Work is shortly to be begun on extensive new repair shops at Marion, Ind.

##### Hopkinton.

This road is now twelve miles long, from Milford, Mass., northward to Ashland, on the Boston & Albany. It is operated by the Providence & Worcester Company. Arrangements are now being made for an extension from Ashland, north by east, through Framingham, Cochituate and Wayland Center to the Massachusetts Central Road, a distance of about 12 miles. The town of Wayland has voted to take stock in the extension.

##### Iowa Pacific.

The contract for grading 50 miles of this line from Fort Dodge, Ia., westward through Sac City, has been let to Ingersoll & Phelps.

##### Grand Junction.

The surveys of this road from Quincy, Ill., eastward to Beardstown have been completed, and an effort will be made to begin work at once.

##### Wisconsin Central.

The officers of this company state that this road will be completed 10 miles south of the iron range and 90 miles north of Steven's Point this season, leaving a gap of only 30 miles, much of which is graded.

Extensive new discoveries of iron ore are reported in the Penobscot Range near the line of the road.

##### Boston, Concord & Montreal.

This company is about to issue consolidated mortgage bonds to the amount of \$3,000,000. These bonds are to be used to complete the payment for the stock of the White Mountains Railroad Company, to meet the cost of the extension from Lancaster to Northumberland and the branch to the Twin Mountain House, and to retire all existing indebtedness.

There is some talk of extending the road from Northumberland, N. H., northward to Colebrook, about 25 miles.

##### Lake Ontario Shore.

A misunderstanding has arisen between this company and the people of Charlotte, N. Y., touching the location of the bridge over the Genesee in that village. Two acts were passed by Congress authorizing the railroad company to construct a bridge over the river at or near Charlotte. In the first, it was made obligatory on the company to build the bridge at a point at least one mile above the mouth of the river. This appeared to be satisfactory to all concerned at the time. At the last session of Congress, however, a second act was passed, by which the railroad company was empowered to construct a draw-

bridge over the Genesee, but its place of location was not named. The company has graded its tracks so as to necessitate a bridge a quarter of a mile from the mouth of the river. Hence the anticipated trouble.

#### New York & Long Branch.

The grading is completed from South Amboy, N. J., as far as Chesepeake Creek, and work is progressing rapidly.

#### Painesville & Youngstown.

The grading is almost completed for the extension of this narrow-gauge road from Chardon to Youngstown (about 45 miles), and the track is to be laid directly. The track is also to be extended from Painesville north to the lake shore at Fairport, about two miles.

#### Pacific Mail.

At a meeting held in New York, August 28, the directors of the Panama Railroad Company authorized the purchase of six steamers of the Pacific Mail Company for \$500,000, giving the latter company the right to redeem the property at the end of one year on the payment of the sum advanced, with interest. Subsequently the directors of the Pacific Mail Steamship Company appointed a committee to complete the negotiation with the Panama Company.

#### Savannah to Liverpool.

Parties interested in the establishment of a new line of steamers from Savannah, Ga., to Liverpool, have been in Louisville, Ky., trying to secure the co-operation of the merchants of that city in the scheme.

#### Portage Lake Ship Canal.

The Houghton (Mich.) *Mining Gazette*, of recent date, says: "After five years of active work the enterprise of opening a ship canal to connect Portage Lake with the waters of Lake Superior on the west is nearing completion. The inducements to undertake this great work were that steamers and vessels bound up or down the lake were compelled, in calling at this port, to go some 40 or 50 miles and return out of the straight course around Keweenaw Point. The bulk of the copper product of this country always has been, and will continue to be, forwarded from Portage Lake. Over 12,000 of the 15,000 tons produced in 1872 have been shipped from here, making this port one of the first in commercial importance on the lake. The passage around Keweenaw Point has always been looked upon by sailors with dislike, and in thick and heavy weather is a hazardous one, the harbors or shelters from storm being available only for smaller boats. The actual distance by survey from Portage Lake around the point to the ship canal is 112 miles, and the distance to be sailed over probably sometimes in excess of that. From Houghton or Hancock, through the ship canal to the open lake, is only 9 miles."

"The natural obstacles that have been overcome, and the immense amount of labor performed here, stamp this as the largest and most important improvement upon the lakes, next to that at the Sault, where fewer difficulties and barriers were met with. Railroads were constructed and equipped for the removal of earth and sand above the water level; five steam dredges of the largest kind have been in constant use, tended by from 30 to 40 scows and four tugs; four pile-drivers have driven nine miles of continuous piling as close together as it was possible to place them, and behind the front row sheath piling four inches in thickness has been driven to prevent the sand from percolating through. The piles are in two rows, six feet apart on either side, the entire length of the canal, two miles and a quarter, and on the inside tier are two rows of top timber, binding the whole firmly together, giving the structure a look of real solidity and finish. As the work neared the lake it grew heavier, and for a long distance the cut measures, from surface to bottom, over 40 feet in depth. The total excavation is estimated at 1,250,000 cubic yards, all of which has been piled upon the bank or dumped in the deep waters of the lakes. It is at the outer end that skillful engineering and the most difficult work has been done in sinking cribs and building piers that shall resist the heavy seas to which the new harbor at some seasons of the year is exposed. Two parallel piers 250 feet apart, 1,000 feet in length and from 20 to 30 feet wide are securely fixed and seem as solid as a ledge, defying the winds and seas of the past season. They are receiving their last loads of stone, and will be immediately planked over for further protection. These piers are seven feet above, and the outer ones sunk in 21 feet of water. Five thousand cords of stone have been used in loading these cribs, or a total weight of 40,000 tons. The heavy dredging is entirely done, the dredges now putting on the finishing touches, or, as they call it, "cleaning up." A few hundred piles to drive, a point to straighten, two or three small cribs to fill and sink at the inner end, and the work will be open to vessels drawing 14 feet of water. The increased tonnage passing through Portage Lake will necessitate the widening, deepening and straightening of the channel by the Portage Lake & River Improvement Company at the east end, which will undoubtedly be done next season."

#### Chesapeake & Ohio Canal.

The surveys for the western extension of this canal to the Ohio River, for which surveys Congress appropriated \$5,000 last winter, are now going on under charge of Major Sedgwick, of the United States Engineers. Meantime, it has been proposed to extend the canal eastward from Washington to Chesapeake Bay, at Annapolis, Md. This extension would avoid the long trip down the Potomac to the bay, besides avoiding the expense of transhipment at Washington or Alexandria, as the canal boats can be taken through the existing canals to Philadelphia and New York. The proposed extension would pass across Washington to the Anacostia or Eastern Branch of the Potomac, and thence follow that stream to sufficient elevation across the country to the Severn, at Annapolis, a distance of less than forty miles.

#### Plymouth, Kankakee & Pacific.

There is a movement among the creditors of this company (which has a large amount of grading done but no road completed) to have it put into bankruptcy, but we believe no action has been begun yet, or even decided upon.

#### Delaware, Lackawanna & Western—Morris & Essex Division.

The contractor, Mr. McAndrews, began work on the new tunnel through Bergen Hill September 1. A considerable force is already at work and it is to be gradually increased until about 1,000 men are employed. By the terms of the contract the use of nitro-glycerine and giant powder in blasting are prohibited. The construction of the approaches will probably not be commenced for some months yet.

#### Chesapeake & Ohio.

The freight business of this road is rapidly increasing. A large order for new freight cars is being delivered at the rate of 200 cars per month, and 14 new locomotives are shortly to be placed upon the road. As mentioned some time since, arrangements have been made with the Old Dominion and Clyde steamship lines by which freight is carried through to Philadelphia and New York.

The surveys of the projected new line from Clifton Forge to Richmond by the valley of the James River, have, it is said, proved that the line can be constructed with a ruling grade of 28 feet to the mile, against 79 feet by the present line.

The Norfolk (Va.) *Journal* of August 26 says: "Capt. James M. Hunt, an agent of the Chesapeake & Ohio Railroad, is at Yorktown, Va., for the purpose of letting out contracts for

building wharves on the company's property at that point. Major Temple, constructing engineer, has reached a point east of Williamsburg, en route for Yorktown, and is cutting a track one hundred feet wide clear through from Richmond, upon which the road will be constructed. This fact, taken in connection with Capt. Hunt's visit, seems conclusive that grading will be commenced in a very short time."

A new round-house to hold 48 engines is being built in Richmond. Only one-third of the structure is to be completed at present, the remainder to be put up when required. The locomotives on the road are all being altered to burn coal, instead of wood, as heretofore.

#### Baltimore & Ohio.

Work on the Alexandria Branch of the Washington City & Point Lookout road, which is to be used by the Baltimore & Ohio as its line to Alexandria, is progressing rapidly. It is said that the company has purchased the two large ferry boats formerly used by the Philadelphia, Wilmington & Baltimore to make the transfer across the Susquehanna at Havre de Grace. These boats are to be used for the transfer across the Potomac at Alexandria as soon as the railroad is completed.

#### New Bedford & Taunton.

The affairs of this company have been closed up, the road and property transferred to the new company, the New Bedford Railroad Company, and a final dividend of 166 per cent. to the stockholders declared. The capital stock of the company was \$500,000 and its funded debt \$171,500, and a large portion of the property, real estate, equipment and improvements on the road had been paid for out of the earnings, so that the capital account really represented much less than the actual cost of the property. Nearly all the stockholders of the old company have taken stock in the New Bedford Company.

#### New Bedford.

This company now owns all the property of the old New Bedford & Taunton Company, consisting of the railroad from New Bedford, Mass., to Taunton, 20 miles, with the extension to the wharves in New Bedford, the Fairhaven Branch, from West Wareham to Fairhaven, 15 miles, the Weir Branch, 0.65 miles, and the Acushnet Branch, 0.35 miles, making in all 36 miles of road. The capital stock of the new company is \$1,000,000. The road is operated by the Boston, Clinton & Fitchburg Company.

#### Boston, Clinton & Fitchburg.

The new line of steamers to run in connection with this company's roads, from New Bedford, Mass., to New York, has commenced running.

#### Los Angeles & San Pedro.

The contract for the branch from Florence, Cal., to Los Angeles, seven miles, has been let to Charles Morgan, of Santa Ana, and work has been commenced. The grading is to be completed in 60 days. The construction of two other branches, one eastward, the other northward from Los Angeles, is shortly to be commenced.

#### Buffalo & Jamestown.

On the City Engineer's certificate of the completion of the fifth section of five miles, the City Council of Buffalo, August 25, directed city bonds to the amount of \$75,000 to be issued and delivered to the company, in exchange for capital stock of the company to the same amount.

#### West Wisconsin.

A new and handsome train, from the company's shops at Hudson, Wis., has been placed on the line from St. Paul to Chicago. Another train for the same line is nearly ready. The new train consists of a baggage car and two coaches.

#### Milwaukee & Northern.

Surveys are being made for the extension of this road northward from its present terminus at Green Bay, Wis. By the terms of the subscription to the road by the people of Shawano County, the company is obliged to complete the line from Green Bay to Shawano as follows: To Pittsfield, ten miles from Fort Howard by the 31st of January, 1874, to Angelica, twenty miles west of Fort Howard, by the 1st of July next, and to Shawano by the 31st of January, 1875.

The intention is to extend the road eventually to a connection with the Marquette, Houghton & Ontonagon road near Lake Michigammi, in the upper peninsula of Michigan.

#### New York & New Orleans.

There is talk of a grand company to be organized to build a railroad direct from New York to New Orleans, ignoring all existing lines. The New York terminus is to be on Staten Island, some seven miles from the city, where extensive wharves and storehouses are to be established, and cotton and grain shipped to Europe. The only parties thus far engaged in the project appears to be certain holders of property on Staten Island, on whose land the wharves and storehouses are to be located.

#### Eastern.

The Boston *Advertiser*, of recent date, says: "This company, through its purchasing agents, Mr. Charles Robinson, Jr., and Mr. R. H. Parker, is quietly at work purchasing estates located in the territory it has taken in this city for railroad purposes. Some fifty estates are now being negotiated for, and the company is desirous of having the land clear this fall. To obtain communication by rail with the proposed freight stations, tracks will be laid from the line of the present road near Cambridge street, either upon piles or solid filling, over the land and flats owned by the company which intervene between Cambridge street and the State prison, passing outside of the prison enclosure near the rails of the Boston & Maine Railroad, and across Austin street at grade. For the carrying out of this project, the company is empowered to increase its capital stock to an amount not exceeding \$1,000,000, but it is estimated that the expenses attendant upon its development can be brought as low as \$750,000."

#### United States Rolling Stock Company.

The semi-annual report of this company for the half year ending June 30, 1873, is published in the London financial papers of recent date. The report says:

"The earnings of the six months ending June 30 have enabled the board of trustees to declare a dividend of 6 per cent. in gold, being at the rate of 12 per cent. per annum, payable in full on the first issue and *pro rata* on the second issue of the share capital of the company, leaving, after paying the operating expenses, a sufficient balance as a reserve fund to provide against the loss for wear and tear on the property, for which the lessees are not accountable. Should this fund not be needed for other purposes considered essential to the success of the company, then it will be distributed in accordance with the terms of the prospectus. The statements appended give, in a condensed form, the transactions of the half year just expired, leaving for the annual report the detailed statements of the working of the company during the twelve months. It will be noticed in referring to the statements of the rolling stock owned by the company, and to its cost, that there remains now but little equipment to receive, and that within the next two months the whole capital will have been paid out, when your company will earn a full rental on its property, while it has heretofore only received it on that part of its capital represented by the rolling stock delivered. The demand for the rolling stock on lease has constantly increased; there are applications on file for 2,000 coal cars and 2,500 box cars, as well as for several locomotives and other cars, such as flats, passenger coaches,

&c. In mentioning this demand I only desire to confirm what I stated in my report of January 15, 1873, that any reasonable addition to the present capital of the company can be safely and advantageously invested."

The financial statement is as follows:

Balance to credit of profit and loss.	\$26,651 19
Estimated gross rental from January 1 to June 30, 1873.	441,129 00
Interest.	14,546 00

Estimated general expenses from January 1 to June 30, 1873.	\$24,466 16
Insurance.	80 63
Doubtful accounts.	17,944 21
Freight.	5,475 33

Estimated general expenses from January 1 to June 30, 1873.	\$48,336 19
Balance available for dividend and reserve fund.	\$43,581 86

#### East Pennsylvania.

The second track is completed and in use from Reading, Pa., to Temple, five miles. Work on the second track from Allentown to Emmaus is progressing rapidly.

#### New Castle & Franklin.

An exchange says: "Several routes have been surveyed for a connection with the Jamestown & Franklin road, but no route has so far been selected. It was generally supposed that the connection would be made at Stoneboro, but that route presents too heavy grades which cannot be overcome. The connection, therefore, will have to be made at the most feasible point between Mercer and Stoneboro, or at such a point on this side of Stoneboro. It will not escape the notice of the directors that this side of Stoneboro is the most desirable. That connection can be made at Steckel's Run, midway between Stoneboro and Raymiton, without heavy grades. The recent movement making Raymiton a great oil-tanking depot would throw to the New Castle & Franklin road a heavy freight business, and the nearer its track can be got to the great reservoir of tanks the more profitable it will be for the road. At Steckel's Run the distance to the Raymiton oil reservoir is only three miles."

The road is already completed from Newcastle, Pa., on the Erie & Pittsburgh road, north by east to Mercer, about 20 miles. Erie.

The London agent of this company reports that the London Stock Exchange has decided to accept as good delivery certificates of Erie stock transferred by the London Banking Association (limited) and registered by the Union Bank of London, equally with New York certificates with Duncan, Sherman & Co., transfer agents, and Farmers' Loan and Trust Company, registrars of transfers, the stock being discharged from one office to the other.

#### The Sny Island Levee.

The Quincy (Ill.) *Whig*, of August 30, says: "Over two hundred teams and a large force of laborers commenced work on the Sny Levee Thursday, and will push the job as rapidly as possible. The force will be divided, part commencing at the Sand Slough fill and finishing up toward the head of the Sny, while the balance will begin operations below Rouses' place and work down toward the cut-off."

#### Detroit, Adrian & Fort Wayne.

This company purposes building a line from the Grand Trunk Junction, near Detroit, 200 miles southwest through Tecumseh and Adrian, in Michigan, Fayette and Bryan, in Ohio, and Fort Wayne to Kokomo, in Indiana, there connecting with the Logansport, Crawfordsville & Southwestern Railway. The line is to form a direct connection between St. Louis and Detroit and the Grand Trunk Railway. The line has already been located from Saline, in Michigan, to the Ohio State line, and preliminary surveys have been made as far as Fort Wayne.

#### Cleveland, Mount Vernon & Delaware.

This company's road is now completed to Columbus, O., an extension of 22 miles since our last reports. Regular trains commenced running by this route from Cleveland to Columbus, September 1. The distance between the two places by this line is about 176 miles. The company does not own the whole line, but uses 26 miles of the Cleveland and Pittsburgh track from Hudson to Cleveland.

#### Des Moines Rapids Improvement.

The contract for the excavation and embankment, and construction of the embankment wall of the guard lock and canal and the channel at the entrance to the canal now in process of construction around the Des Moines Rapids, at Keokuk, Ia., has been awarded to Kittie & Middleton, of Keokuk. The amount of their bid was \$190,450.

#### Covington & Lexington.

At the call of the City Council of Covington, Ky., a meeting of persons holding stock in this company (whose road is now known as the Kentucky Central) was held in Paris, Ky., August 20. The possession of the road is now in litigation between the old company and the parties known as the "Bowler heirs," who are now in possession. About 20 stockholders were present, representing personally and by proxy nearly one and a quarter million dollars of stock. The call of the meeting was with a view to obtain an expression of the stockholders in favor of selling the road, as soon as possessed of it by the trustees of the Cincinnati Southern Railway. Resolutions were passed disapproving of the action of the Covington Council in calling the meeting, and that the present was no time to talk about disposing of the road when the directory had not the means to ascertain its actual value. The Kentucky Court of Appeals, last April, decided that the road belonged to the stockholders, out of whose bands it was sold, but judgment is suspended pending a motion for a rehearing.

#### WHEELING & L. E. E.

It is said that a contract has been made with Shandley Brothers (contractors for the Hoosac Tunnel) to build and equip the road from Wheeling, W. Va., to Toledo, O., about 200 miles, for \$50,000 per mile. The road has been finally located from Marten's Ferry, near Wheeling, to Lodi, in Medina County, O., 106 miles, and work is shortly to be begun. The building of the road into Wheeling depends on the arrangements made for the construction of the bridge over the Ohio at that point. If no satisfactory arrangements can be made about the bridge, the road will have its terminus at Belaire, O.

#### Kansas City, Memphis & Mobile.

The board of directors has resolved to issue bonds to the amount of \$20,000 per mile on the section of 100 miles from Kansas City, Mo., eastward to Osceola, on the Osage River.

#### Railroad Building in Massachusetts.

Railroad building in Massachusetts is, according to the Springfield *Republican*—a good authority—unusually active this year. Of new road, about 50 miles has already been constructed, or opened this year, which is more than the average rate of increase for some years past. The Springfield, Athol & Northeastern Extension to Springfield—16 miles—will probably be finished in October, and work is actively proceeding on the extension of the Ware River road from Gilbertville to Winchendon—28 miles—of which seven miles is already completed. Work, we believe, is also going on on an extension of the Boston, Barre & Gardner. A branch of the Worcester & Nashua road is also being built from Lancaster to Hudson, 7 miles,

The Massachusetts Central has between 70 and 80 miles under contract, a part of which is to be done this year, while the remaining 20 miles of the line is being located. Last and most important of all is the Hoosac Tunnel, which is to be completed this year. Most, if not all of these lines, except the tunnel, are mainly of local importance, although it is reported that the Boston & Lowell Company intends to extend its new Middlesex Central line eventually to Fitchburg, there to connect with the line to the Hoosac Tunnel.

Of projected roads, on which work is not yet begun, the only line which seems to promise much is the Lowell & Andover, from Lowell to Ballardvale, on the Boston & Maine, eight miles. This, it is said, is intended not only to give a line from Lowell to Boston, but also to enable the Boston & Maine to forward eastern freight to or towards New York over the Boston, Clinton & Fitchburg's Lowell & Framingham Division and its New Bedford line. The Worcester County Central is yet only in the stage of talk and the Springfield & Longmeadow seems to depend mainly, if not entirely, on the action of Springfield in voting aid. Nothing has been done about the proposed branch from the New Haven & Northampton to Springfield, and the Lee & New Haven Company has stopped work altogether since the failure to obtain an extension of the State grant of aid, though it is said the company intends to make another trial next year.

#### Meriden & Waterbury.

A railroad is proposed, to extend from Meriden, Conn. (18 miles north of New Haven), westward to Waterbury, a distance of about 13 miles. At Waterbury connection will be made with the Naugatuck road.

#### Connecticut River.

A sale was made in Boston, August 23, of 500 shares of new stock of this company for \$137.50 per share of \$100. This is the third sale of new stock, the proceeds being used for the building of the second track from Springfield, Mass., to Northampton, 17 miles.

#### Boston & Maine.

A connection is to be made with the Grand Trunk at Portland, Me., so that Boston & Maine cars can be run into the Grand Trunk depot and freight and passengers transferred directly.

#### Oregon & California.

The committee which the German bondholders sent to Oregon to examine into the condition of this property, and see what could be done to insure its paying the interest on its bonds has returned, and is to report soon. It is said that the only hope of a settlement is in an agreement to accept a lower rate of interest, as it is deemed impossible for the road to earn 7 per cent. on its debt.

#### Northern Pacific.

Hon. B. F. Wade, Mr. C. W. Mead and Charles Carleton Coffin, representing this company, have been negotiating with the Post-office Department at Washington to secure a contract for the transportation of the mails from the present terminus of the road at Bismarck, Dak., to Helena, Montana, about 800 miles, for which \$150,000 per year was asked. The Department refuses to establish a service over the proposed route.

#### Arkansas, Shreveport & Texas.

This company, which was organized at Shreveport, La., August 21, purposed to extend the New Orleans, Little Rock & St. Louis road from the Arkansas State line, southwest through Shreveport to the Sabine River, whence the line is to be extended southward by a Texas company.

#### Wisconsin.

A dispatch from Madison, Wis., under date of August 26, says: "Gov. Washburn has as yet neither seen nor heard, except through the newspapers, anything of the tender of the \$125,000 bond for liquidated damages, which President Cary, as reported by the Milwaukee *News*, stated, on the 23d, had been made to the Governor. The last the Executive heard from Mr. Cary, he declined to give the bond for liquidated damages to any amount."

#### Maine Central.

This company has decided to build an iron bridge across the Kinebec, at a point midway between Waterville and Kendall's Mills. The old bridge at Waterville will be retained. About two miles of the newly-laid track on the east side of the river will be taken up. The junction of the two lines from Portland will be made at Waterville. The new bridge will replace the one lately burned at Kendall's Mills, which the company had decided at first to abandon altogether.

#### Somerset.

This road, the track on which was laid last year, is now being ballasted and put in order preparatory to its opening for business. The road is 17 miles long from West Waterville, Me., northward to Norridgewock. An extension of seven miles, to Madison Bridge, is to be completed this fall.

#### Southern Pacific, of California.

The branch line from Gilroy, Cal., to Hollister has been extended southward six miles from Hollister to Tres Pinos. The extension from Salinas City to Soledad Crossing, 25 miles long, is now opened for business.

The certificate of consolidation of the Southern Pacific Railroad Company and the Southern Branch Pacific Railroad Company has been filed with the Secretary of State of California. The capital stock of the consolidated company is to be \$90,000,000.

#### Minneapolis & St. Louis.

It is reported that this road will before long pass into the hands of the St. Paul & Sioux City Company. The road is 28 miles long from Minneapolis, Minn., southwest to a junction with the St. Paul & Sioux City near Shakopee. It is now leased by the Lake Superior & Mississippi Company and sub-leased to the Northern Pacific.

#### Union Depot at Sioux City.

A union depot is to be erected in Sioux City, Iowa, by the companies whose roads enter that city, the Illinois Central (Iowa Division), St. Paul & Sioux City, Sioux City & Pacific and Dakota Southern.

#### Atlantic & Pacific.

Argument on a motion to continue the temporary injunction to restrain this company from paying the dividend due on Missouri Pacific stock was heard before Judge Daniels, of the New York Supreme Court, in New York, August 29. The counsel for Mr. S. P. Dinsmore, who applied for the injunction, alleged that the company, without authority of the act of incorporation, or of any statute of the United States, leased in July, 1872, the Pacific Railroad of Missouri, which is entirely separate from the route of the Atlantic & Pacific designated in the act of incorporation, which says the line shall run directly west; that in the lease they guarantee dividends of 5 per cent. yearly for three years, 6 per cent. for the next two years, and 7 per cent. thereafter, upon the capital stock of the Pacific Railroad of Missouri; that 55,000,000 acres were granted by the United States to the Atlantic & Pacific Company, which offered them for sale at their naturally increased value on account of the line of railroad through the section, and last year received \$169,439.31 net cash. The injunction was first obtained to restrain the payment of dividends out of the company's earnings and out of receipts derived from the sale of lands granted by the act

of incorporation upon the capital stock of the Pacific Railroad of Missouri, guaranteed by the Atlantic & Pacific as a consideration for the lease between the companies. The dividend was announced to be paid last July.

The company claims that it is authorized to make the lease in its charter, and that the lease was absolutely necessary in order to obtain possession of the line into St. Louis, which was much needed and which could not be obtained without leasing the whole of the Missouri Pacific.

The court reserved its decision.

The St. Louis *Republican* says that under the new alliance between this company and the Texas & Pacific, it is proposed to unite the two roads at Antanchia, about 60 miles southwest of Santa Fe, N. M., and build the line from that place to San Diego in common.

#### Meetings.

The regular semi-annual meeting of the Association of General Freight Agents of the South was held at White Sulphur Springs, West Va., August 27.

The annual meeting and election of directors of the Toledo, Wabash & Western Railway Company will be held October 1. The transfer books will be closed from September 4 to October 6.

#### Davenport & St. Paul.

This company ceased to use the Chicago, Rock Island and Pacific track into Davenport, Ia., August 27. The injunction obtained by the city authorities has obliged the company to cease work on its own track into the city. Accordingly a depot is being built about two miles north of the business portion of the city. All freight to and from Davenport has to be hauled to this depot by teams. Freight from stations up the road for eastern points is transferred to the Chicago & Northwestern at Wheatland, or the Illinois Central at Delaware.

#### Evansville, Owensboro & Nashville.

This company filed its articles of incorporation with the Secretary of State of Indiana, August 26. The line is designed to run through the counties of Vanderburgh, Warrick and Spencer, from Evansville to Owensboro, a distance of 30 miles. The capital stock is to be \$1,000,000, and the corporators are Charles Denby, Victor Bisch, Blythe Hines, T. R. McFerson, M. Henning and William M. Aiken.

The stockholders of the Owensboro & Russellville Railroad Company at a meeting held in Owensboro, Ky., August 28, authorized the directors to effect a consolidation with the Evansville, Owensboro & Nashville Company. The intention is to make a line from Evansville to Nashville, Tenn.

#### Selma, Marion & Memphis.

An extension of eight miles, from Greensboro, Ala., westward to Sawyer's, has been completed and opened for business, making 44 miles of road now in operation.

#### Sodus Point & Southern.

The general offices of this company, heretofore at No. 80 Broadway, New York, have been removed to Sodus Point, Wayne County, New York.

#### New Orleans, Little Rock & St. Louis.

This company's line is intended to run from some point near the Saline River, on the Cairo & Fulton road, southward to Camden, Ark., and thence southwest to the Louisiana line, a distance of about 120 miles. The State of Arkansas has donated to the company 500,000 acres of land, and the towns and counties along the line have voted the company 250,000 acres of land and about \$500,000 in bonds. It is stated that the Cairo & Fulton Company will build the road, provided \$1,000,000 in bonds and 1,000,000 acres of land can be secured.

#### Taxing Railroad Lands in Minnesota.

The old Minnesota Central Railroad Company has sued out an injunction to restrain the Auditor of Minnesota from listing certain railroad lands for taxation. Under the charter the lands were to be exempted until sold and conveyed, but in lieu of other taxation, the company was to pay annually three per cent. on its gross earnings into the State treasury. Having transferred its franchises to the Milwaukee & St. Paul Company, while retaining its lands, the Railroad Commissioner, sustained by Governor Austin, holds that the first-named company is no longer entitled to exemption of its lands.

#### Marietta & Pittsburgh.

The extension from Cambridge, O., north to Liberty, 10 miles, was opened for travel August 19. A correspondent informs us that the road is very nearly completed to its terminus at Canal Dover. A large part of the line passes through a section of Ohio not heretofore provided with railroad facilities. Our correspondent adds: "A peculiarity of this road is that it is not a single dray road on it, and its employees and officers are strictly sober men."

#### Winona & St. Peter.

The Land Commissioner of the company has filed the maps of the completed line with the Governor of Minnesota at St. Paul. The entire length of the road from Winona, Minn., to Lake Kampeska, Dak., is 326.86 miles. The first passenger train left Winona for Lake Kampeska, August 21.

It is reported that the line will be extended next summer about 60 miles further west to reach some fine coal beds recently discovered.

#### Burlington, Cedar Rapids & Minnesota.

It is stated that the gap in the Milwaukee Division between West Union and Independence, Ia., will be closed by the middle of September.

#### Michigan Air Line.

The meeting of stockholders which was to have been held at Union City, Mich., August 27, for the purpose of ousting the present board of directors, has been adjourned to October 20, the time for the regular annual meeting. Meantime active efforts are being made to settle existing difficulties.

#### Joliet & Valparaiso.

The line through Joliet, Ill., has been located and work was commenced on the grading August 25.

#### Chicago, Joliet & Peoria.

Ground was broken on this new road at Joliet, Ill., August 25.

#### Kansas Midland.

The people of Shawnee County, Kansas, voted August 22 against issuing \$200,000 in bonds in aid of this road. The majority against issuing the bonds was 608.

#### Springfield, Athol & Northeastern.

The track on the extension from Barrett's, Mass., to Springfield is laid to Indian Orchard, within six miles of Springfield and ten miles from Barrett's. The deep cutting beyond that point is nearly completed and will be ready for the track-layers by the time they reach it. A tract of land for repair shops has been purchased in Springfield.

#### Portland & Ogdensburg—Vermont Division.

There have been reports that the Central Vermont Company had commenced negotiations for a lease of this line. It is not thought likely that any such lease will be made.

The town of Waddington, N. Y., has voted to issue \$50,000 in bonds in aid of the New York section of the Portland & Ogdensburg line.

#### ANNUAL REPORTS.

##### Cincinnati, Hamilton & Dayton.

This company owns a line from Cincinnati, O., northward to Dayton, 60 miles. It also operates under lease the Dayton & Michigan Railroad, from Dayton, O., to Toledo, 142 miles, and the Cincinnati, Richmond & Chicago Railroad, from Hamilton, O., to Richmond, Ind., 45 miles, making a total of 247 miles operated. The accounts of the leased roads are kept separately. It has lately leased the Cincinnati, Hamilton & Indianapolis (formerly the Junction) Railroad, the stock of which it owns, and which extends from Hamilton, O., to Indianapolis, Ind., 98 miles, making the total mileage operated 345 miles.

Two extra rails are laid over the road from Dayton to Cincinnati, over which the trains of the Atlantic & Great Western (6-foot gauge) are run.

The operations for the year ending March 31, 1873, were as follows:

Earnings:	
From passengers.....	\$37,891 35
From freight.....	530.16 65
From mail.....	9,485 56
From express.....	16,225 19
From rents from other companies.....	197,384 84
From rents from real estate.....	8,341 00
From mileage of cars.....	5,577 10
From interest.....	16,411 60
From miscellaneous.....	2,194 33
Total (\$20,031 per mile).....	\$1,204,965 37
Expenses:	
Wood, coal and oil.....	\$110,005 10
Snaps and engine houses.....	11,197 21
Maintenance of way.....	169,557 39
Bridges.....	13,010 50
Locomotive power.....	86,857 37
Passenger train expenses.....	58,042 23
Freight train expenses.....	67,377 63
Other train expenses.....	13,725 31
Station expenses.....	93,447 49
Office expenses.....	44,044 51
Miscellaneous expenses.....	42,218 08
Total expenses (53.89 per cent.).....	700,492 88
Net earnings (\$8,236 per mile).....	\$495,372 75
From which deduct—	
Dividends, October, 1872, and April, 1873, four per cent. each.....	\$280,000 00
Interest on bonds.....	141,990 00
Taxes.....	48,577 75
	473,667 75
Leaving a surplus for the year of.....	
Add sundry profit and loss.....	\$21,515 00
Add balance from previous year.....	24,416 34
	705,230 57
Total.....	\$751,121 91
Deduct loss in operating Dayton & Michigan Railroad.....	\$31,471 26
Amount on account of steel rails.....	27,477 91
	81,971 26
Total balance.....	\$649,651 65

As compared with the previous year there was a decrease of \$102,730, or 7½ per cent., in gross earnings; a decrease of \$9,530, or 1½ per cent., in expenses; and a decrease of \$112,260, or 18½ per cent., in net earnings.

The number of miles run by trains earning revenue was 549,574, and the average earnings per train mile were \$2,192.1. The average running expenses per train mile were \$1.29. The trains transported during the year 750,687 passengers and 564,542 tons of freight.

The operations of the Dayton & Michigan road for the year were as follows:

Gross earnings (\$7,286 per mile).....	\$1,34,567.10
Operating expenses (9½ per cent.).....	723,110.18
	512,556.92
Net earnings (\$2,200 per mile).....	
Taxes.....	\$2,813 73
Interest on bonds.....	91,496.93
Dividends, preferred stock.....	88,274.00
Dividends, common stock.....	33,915.63
	336,520.23

#### Loss on operating road.....

As compared with the previous year there was a decrease of \$67,045, or 6½ per cent., in earnings; an increase of \$24,490, or 3½ per cent., in operating expenses, and a decrease of \$91,635, or 22½ per cent., in net earnings.

The operations of the Cincinnati, Richmond & Chicago road for the year were:

Gross earnings (\$5,103 per mile).....	\$229,634.94
Operating expenses (69 per cent.).....	153,661.33
	70,973.71
Net earnings (\$1,577 per mile).....	\$1,900.93

Interest on bonds.....	43,279.98
	\$15,180.31

#### Profit on operating.....

As compared with the previous year this shows an increase in gross earnings of \$17,780, or 8½ per cent.; a decrease in operating expenses of \$7,518, or 4½ per cent.; and an increase in net earnings of \$25,298, or 5½ per cent.

The earnings and expenses of the whole system of roads for the year were as follows:

Gross earnings (\$9,996 per mile).....	\$2,469,067.61
Operating expenses (64½ per cent.).....	1,590,264.23

#### Net earnings (\$3,975 per mile).....

There were expended for permanent improvement during the year \$780,120.18, as follows: For real estate at Dayton and Brighton, \$35,552; for right of way, \$250; for 4 locomotives, 50 flat and 50 long box lumber cars, \$121,000; for account Dayton & Michigan Railroad, \$117,576.82; for depot grounds, East Toledo, \$79,461.21; advanced on account of purchase of Cincinnati, Hamilton & Indianapolis Railroad, new equipment, and renewal of bridges, road, etc., \$126,325.15.

During the past year two dividends of four per cent. each were paid to the stockholders. The net earnings show a fraction over 8½ per cent. on the capital stock. The regular business of the several roads was seriously interfered with by the breaking out of the horse disease in

the Cincinnati, Hamilton & Dayton road this season; when this contemplated change is made, we will have on hand some eight thousand tons of iron now used for the accommodation of the broad-gauge business, which, with a small additional cost, would enable us to relay our main track between Cincinnati and Dayton with the best quality of steel rails.

"We have now in our track some 22½ miles steel, and 2 miles steel-capped rails, some 751 tons steel having been laid during the past season, at a cost of \$88,367.20, the difference in cost between steel and iron having been charged to surplus earnings, and in addition thereto 731 tons of rerolled iron, at a cost of \$26,390.41 have been laid; the credits from old rails reducing the actual cost to \$74,787.10.

"In the judgment of your board of directors, considering the heavy traffic passing over our road, it seems to be a needless expenditure of money to continue the laying of iron rails, and no time should be lost in relaying the entire tracks of this company with steel between Cincinnati and Dayton, and the means to accomplish this object should be provided without unnecessary delay.

"In order to secure future dividends, from the low rates of passengers and freights now prevailing, an additional volume of business must be moved, and freight trains run at a much reduced rate of speed to accomplish this object with safety and economy; double tracks laid with the best quality steel rails should be adopted, and the saving from such a course would in a few years not only pay the present expenditure, but go far toward meeting the bonded debt of the company as the same becomes due.

"There has been laid in the track of the Dayton & Michigan Railroad during the year 1,572½ tons of rerolled iron at the cost of \$122,763.25, and there will have to be used in this track this season some 2,000 tons of rails to make good the destruction of iron during the past winter.

"The Cincinnati, Richmond & Chicago Railroad was furnished with 283 tons rerolled iron at the cost of \$10,186.71; this road will require about the same amount this year.

"The Junction Railroad, a line extending from Hamilton to Indianapolis, having, by a decree of the courts of Indiana and Ohio, been offered for sale on the 26th day of November, 1872, was (in accordance with a resolution passed by the stockholders of this company at their last meeting authorizing the board of directors to make the purchase of said road) purchased for this company for the nominal sum of \$1,000,000. The actual consideration was expressed in contracts made to facilitate the purchase with the holders of the mortgage bonds of the Junction Railroad Company. One hundred thousand dollars was required to be paid in cash and has been paid. The remainder of the purchase money was paid in a new issue of bonds, secured by a mortgage on the road, a new corporation having been organized under the laws of Indiana and Ohio, to which the title was transferred. The whole issue of these bonds is \$2,500,000. By the terms of the contract with the holders of the old bonds, this company guaranteed the payment of principal and interest of the new bonds. Of these \$1,790,000 have been issued and applied in exchange for the outstanding bonds and overdue coupons of the Junction company. The remainder are applicable to the repair and equipment of the road. The actual cost to this company of 98 miles of road, with rolling stock, real estate, etc., was \$1,890,000. The conditions of the sale having been approved by the courts, the possession of the Junction Railroad was surrendered by the Receiver on the 1st of December, 1872, and passed into the control of the new corporation organized on the 23d day of December, 1872, under the name of the Cincinnati, Hamilton & Indianapolis Railroad Company. The entire amount of the nominal capital stock in the corporation is the property of and remains uninsured in the control of this company; and will represent the ultimate value of the road beyond its mortgage debt, less whatever advance may be required for the repair, equipment and improvement of the road. The remaining mortgage bonds, \$710,000, will be disposed of as soon as satisfactory prices can be obtained for them, and the proceeds used for the purpose of putting the road in good condition; large quantities of cross ties, and ballast with some ten miles of iron are required for this purpose, beside an addition to the equipment of the road. Five first-class coal-burning locomotives have already been purchased, and at this date delivered. One hundred and fifty box and fifty platform cars are being built at Lima; one hundred of these having been delivered. The bridge at Brownsville, some 450 feet in length, was destroyed by fire on the evening of the 24th December, 1872, and has been rebuilt. Timber has been ordered for the purpose of rebuilding the long bridge over the Miami River at Hamilton. Considerable real estate has been purchased at Indianapolis, and some other lots have been examined for future purchase.

The balance sheet of the company at the close of the year is as follows:

Construction.....	\$3,974,674.73
Buildings.....	1,127,251.96
Real estate.....	381,022.29
Wood and materials for repairs.....	203,643.2
Wood bands.....	32,540.0
Bills receivable.....	8,361.25
Stocks and novelties.....	316,503.32
Due from railroads companies.....	68,581.24
Due from individual.....	40,999.95
Due from Post-Office Department.....	9,581.51
Cash and cash assets.....	133,744.22
Dayton & Michigan Railroad lessors.....	364,749.53
Cincinnati, Richmond & Chicago lessors.....	54,910.20
Cincinnati, Hamilton & Indianapolis railroad.....	426,251.15
D. McLaren, trustee.....	79,416.21
Total.....	\$25,101.02
Capital stock.....	\$3,000,000.00
Firs mortgage.....	1,250,000.00
Second mortgage.....	500,000.00
Third mortgage.....	282,000.00
Surplus earnings.....	669,651.65
Interest on bonds.....	21,151.65
Dividends unpaid.....	2,320.00
Dividends No. 35.....	140,000.00
Due rail road companies.....	110,911.01
Due individual.....	175,336.47
Due United States.....	963.69
Pay rolls for March.....	100,254.13
Dividend due on Dayon & Michigan preferred stock.....	25,848.00
Dividend due on Dayton & Michigan common stock.....	19,724.15
Bills payable.....	453,625.83
Total.....	\$7,354,101.02

#### Lamoille Valley.

The Vermont Division of the Portland & Ogdensburg Railroad is being constructed by three distinct corporations, of which the Lamoille Valley has the line from Swanton, Vt., southeastward to West Danville, 78 miles; the Montpelier & St. Johnsbury, from West Danville to St. Johnsbury, 15 miles, and the Essex County, from St. Johnsbury to the Connecticut River, 22 miles.

The annual report of the Lamoille Valley Company, presented at the annual meeting held August 12, 1873, says:

"At the time of the last annual meeting of the stockholders, regular trains were running and doing business between St. Johnsbury and Hardwick, a distance of 35 miles, being 20 miles on the Lamoille Valley corporation and 15 miles on the Montpelier & St. Johnsbury corporation. Trains were also running at that date, doing business on the Essex County Railroad corporation between St. Johnsbury and West Concord, a distance of 8 miles.

"Since our last annual meeting the line has been extended from Hardwick to Hyde Park on the Lamoille Valley Railroad,

a distance of 17 miles, and the regular trains commenced running and doing business between St. Johnsbury and Hyde Park on the 15th day of January, 1873.

"A construction train was organized in the spring of 1872, and has been constantly at work up to the present time, except at short intervals, ballasting, filling up temporary trestles and making such other repairs along the line as are needed for a first-class road bed.

The construction of the Lamoille Valley Railroad was commenced with a stock subscription of \$750,000, consisting of \$562,000 in town bonds and the balance in individual subscriptions. The Lamoille Valley Company, also joined with the Montpelier & St. Johnsbury, and the Essex County Companies in issuing a first mortgage bond secured on the property of the entire line in Vermont, of \$20,000 per mile for the purpose of completing the construction and equipment of the line in Vermont from Swanton to the Connecticut River. These first mortgage bonds on the Lamoille Valley amount to \$1,600,000, and the securities, together with the stock subscriptions of \$750,000 amount to \$2,350,000. Up to the 1st day of last July (1873), we had exhausted of the stock subscriptions and mortgage securities, in all that had been expended on the Lamoille Valley from West Danville to Swanton, for grading and masonry, engineering, bridging, rolling stock, track-laying, ballasting, fencing, land damage, depots, cross-ties, &c., including every dollar that has been expended on the Lamoille Valley corporation, \$1,336,817, leaving a balance of stock subscriptions and mortgage securities of \$1,013,183 not yet expended, which balance will be used to finish the construction of the road between Highgate in the County of Franklin and Hyde Park, a distance of 39 miles, and the necessary equipment for the line."

#### Wooden Railroads.

BY H. HAUTU, C. E.

A former article on wooden railroads, published in *Van Nostrand's Magazine*, has elicited some adverse criticisms, but no reason has been assigned why they will not accomplish all that has been claimed for them.

Several communications have been addressed to the writer, soliciting more detailed information, answers to which will be found in the article now presented.

To develop the resources of a country, facilities for transportation are indispensable. Iron ore can be mined and lumber manufactured only to a very limited extent if wagon transportation for any considerable distance over common roads were necessary to reach a market. Where the business is sufficiently extensive to warrant it, and the capital can be secured, railroads, either narrow or ordinary gauge, will afford the best facilities. But there are many localities in which ordinary railroads are impracticable, not from physical, but from financial difficulties in the way of their construction. With a limited capital and a sparse population, railroads cannot be built, even in localities highly favored in natural resources for operations of quarrying, mining and heavy manufacturing. In such cases a substitute for a wagon road, less expensive than a railroad becomes a desideratum.

This substitute has been proposed in a new style of wooden railroad, costing but little more to construct than an ordinary wagon road, yet affording transportation at less than one-fifth the cost by wagon, and less also than the ordinary cost by rail, when interest on capital invested is considered. This road differs essentially from the ordinary tram-road, which consisted of sawed rails, about 3 in. wide, laid on cross-ties, and used with narrow tread iron-wheeled cars. Such roads, although some improvement on the common wagon road with its mud holes and deep ruts, have given very unsatisfactory results. The differences extend to the track, cars and motive power.

#### TRACK.

The track is formed of heavy logs, hewed on the upper side to the width of 8 in., and on the inside at right angles, sufficiently deep to form a straight edge for the flange. These logs are buried so that the top, or rail surface, is almost level with the road surface, resting on stout sills at the ends and middle, to which they are secured by wedged treads. The rails, therefore, are solidly bedded, and not liable to warp or twist. Twenty feet would be a convenient length on curves, but on straight lines longer pieces could be used, the ties being 10 ft. apart. The grading of a sufficient width on a side hill with gentle slopes, would cost about \$200 per mile for a 3 ft. gauge; but, of course, the cost of graduation will vary greatly with the locality. Ravines and small water-courses would in general be crossed with rough trestles or timber cribs. Hewing the timber would cost about \$200 per mile. In a wooded country, where timber can be obtained along the line of the road, where no large bridges are required, and no rock to be excavated, the cost of such a wooden railroad should be covered by from \$500 to \$2,000 per mile, depending upon the amount of earth-work.

#### CARS.

The cars proposed for such wooden railroads are simple frames placed on wheels, without springs, and covered with a floor of plank. The wheels are of wood, built up of pieces cut from 2-in. plank in the form of regular sectors, about 8 in. at the wide end. Four thicknesses of plank will build a wheel with a tread of 8 in. corresponding with the face of the rail. A cast iron hub is inserted in the center, through which an iron axle passes, and a cast-iron flange is bolted on the inside. The timber should be of hard wood, well seasoned, the sectors laid so as to break joints and well bolted. Diameter of wheel about 30 in. Such cars, if used with horses, will cost about \$40 to \$50, or about one-third the price of a farm wagon; they will carry 3 tons, and can be made by any rough hand who can use carpenter's tools. If designed for use with locomotives in trains, draw bars and springs must be used, and the cost per car increased.

#### MOTIVE POWER.

Horse power can be used; but if the tonnage is considerable, it will be preferable to adopt a light engine of 8 or 7 tons, with wide driving wheels, covered with vulcanized rubber tire. Such engines can be manufactured at the Baldwin Locomotive Works for about \$4,000. Passengers could be carried in the proposed roads with such engines at a speed of 10 or 12 miles an hour, which would make a great improvement on the stage coach.

Such roads would rot out long before they would wear out, and the answer to the objection that they are not durable is simply that they will last just as long as the cross-ties on an ordinary railroad, and it will cost less to renew them. Post-work in the South last from ten to fourteen years. The cost of transportation by wagons, for a distance of 25 miles, without return load, is 50 cents per 100 lbs., or \$10 per ton of 2,000 lbs.

Assuming the tractive power on such a wooden road, for the purposes of an approximation, to be double that of an ordinary railroad, or 20 lbs. per ton, the angle of friction would be 48°, to the mile. And a horse exerting a power of 150 lbs., at 23 miles per hour, or four horses 600 lbs., would haul on a grade of 144 feet to the mile, one-fourth of the gross load on a level, or 7½ tons—giving six tons of net load. As a team of 25 miles, returning empty, could be made in two days, a team of 25 miles, to be worth \$3 a day, the cost of the round trip would be worth \$10, or \$1.66 per ton, as against \$10 per ton by wagon transportation; and this, too, on grades of 150 feet to the mile, nearly—tolls for use of road not being included in either case.

This illustration will show the great economy of such roads over wagon transportation, even when operated by horse power; but where the business will warrant it, the rubber-tired locomotive should be used. If, after a few years, a business should be developed sufficient to justify the expense, an iron railroad could be substituted; of which the original grading would form a part—the expenditure would not be lost. It is also to be observed that the rails of the proposed wooden railroad, being even with the surface of the road or nearly so, would permit the same road bed to be used for ordinary vehicles.

**COST OF OPERATING**  
the wooden railway, as compared with an ordinary iron road. Assume length of road 25 miles. Interest 10 per cent., and one engine only, to be provided with a minimum equipment of cars in each case. For an ordinary railway, with 45 lb. rails.

25 miles, \$18,000 per mile.	\$450.00; int. rest.	\$45,000
road repairs, one man per mile labor.	.....	7,500
Locomotive engine, \$12,000; interest and repairs 20 per cent.	2,400	
One good passenger car, \$15.0; interest and repairs 20 per cent.	900	
20 freight cars, \$800.00; interest and repairs 20 per cent.	2,200	
Engineer and crew, \$4.50 per day, 30 d. y.	1,350	
One conductor for both freight and passenger, mixed train.	750	
Three brakemen, \$1 per day	1,080	
Agent at each end of line.	1,210	
Fuel for engine, 2 cords per trip, one trip per day.	1,200	
Renewals of ties, \$120 per mile	4,800	
Wear of rails 20 years, annual wear, \$150 per mile.	3,750	
Supervision.	1,000	
D-pots, sleeping, repairs, etc.	800	
Stationery, insurance, loss, damage and incidentals.	1,000	
Total.....	\$75,830	

This is a moderate estimate of the cost of operating an ordinary railroad, with a minimum equipment for one year, including repairs, renewals and ten per cent. on capital, and amounts to about \$3,000 per mile. If one-third of this income should be derived from passengers, and two-thirds from freight, carried at 6 cents per passenger and 10 cents per ton per mile, the number of passengers carried the 25 miles would be 16,180 and the number of tons 20,200; this amount of business would pay 10 per cent. on the capital invested. To cover expenses and pay nothing on capital would require a business of 6,140 passengers and 7,360 tons—yielding a revenue of \$27,650.

A wooden railway for the accommodation of an equal business would require the following estimate:

25 miles at average cost of \$1,500—\$37,500; 10 per cent.	\$3,750
Renewal of track once in six years, \$33 per annum.	200
6 hands for track repairs.	1,800
Boys \$4,000; 21 per cent.	800
Engineer	910
Train hands	1,800
40 freight cars \$100; 20 per cent.	800
4 passenger coaches \$250; 20 per cent.	200
Agents	1,200
Fuel	810
Supervision, insurance, stationery, incidentals.	1,000
Total.....	\$14,753

To pay running expenses and 10 per cent. on capital will require an income of only \$15,000 per annum. To cover operating expenses, without interest on capital or equipment, about \$10,000.

The amount of business that would pay operating expenses only, without dividends, on an ordinary iron road, would pay operating expenses and a dividend of 40 per cent. upon the wooden railway; and the business that would pay 10 per cent. upon the iron road would pay 142 per cent. upon the wooden road. To pay 10 per cent. upon the wooden road would require a business at the prices stated of 3,300 passengers and 4,000 tons freight.

The capacity of a wooden railway with a single engine of 7 tons and grades of 150 feet to the mile will be estimated. Allow adhesion of engine, 3,200 lbs.: traction on level, 20 lbs. per ton; load on level, 160 tons; on grade of 150 feet, 40 tons; requiring at 3 tons to a car 14 cars, or 12 cars exclusive of weight of engine. The net load carried would be about 28 tons.

A day's trip each way for 300 days would give an annual capacity of 16,800 tons. If the trade should be all one way, only half this amount carried and 10 passengers, \$2 per ton for 25 miles, or 10 cents per 100 lbs., would pay running expenses on such a road, and 12 per cent. dividends; while an iron road could not be operated at all with ordinary equipment, inasmuch as the income would not pay running expenses.

The cases are numerous where such roads would perfectly meet the wants of the public in developing the resources of sparsely-settled localities, and serving as valuable feeder to trunk lines. The estimate for capacity has been made for a single engine of 6 to 7 tons. If the weight or number of engines be increased, the capacity would be increased proportionately. The ultimate capacity with increased equipment would far exceed the requirements of any locality where such roads would be employed.

The question is often asked: What is the limit of grade that can be employed on such wooden railroad? The answer is, grade affects only the load which a given power can transport, and is independent of the road itself, gravity being a retarding force due to inclination solely. At the same time it is true that the more perfect the construction of the road bed and the machinery, the more rapidly does grade reduce the tractive power. On a well-constructed railroad 8 lbs. per ton will move a train, and a grade of 20 ft. to the mile will more than double the required traction for a given load. And every additional 20 ft. would require additional power equal to the resistance of the train upon a level. On a wooden railroad, assuming traction as 20 lbs. per ton, it would require a grade of nearly 50 ft. per mile to double the power, or with a given power to reduce the load one-half. On a grade of 250 ft. to the mile a team of four horses could haul five tons.

The adhesion of locomotives on ordinary railroads does not exceed one-fifth of the weight on drivers, and is measured by the friction of iron upon iron, but the friction of wood on wood is 50 per cent., and that of rubber on wood is probably greater; consequently rubber-tired locomotives could ascend much higher inclinations than ordinary engines upon railroads, the limit of which is about 800 ft. to the mile without load, and whole weight on drivers. The surplus adhesion, however, cannot be utilized without a proportionate increase of cylinder power, which involves also increased boiler capacity.

Such wooden railways, operated either by locomotive or animal power, may become very important agencies in promoting the settlement of localities not supplied with railroad facilities and in developing mineral and agricultural resources.

In the last number of *Van Nostrand's Magazine* (July) there is a statement that more than 100 miles of wooden railroads are in operation in Canada, in the province of Quebec alone. That the gauge is 4 feet 8½ inches, the running time about 16 miles per hour; but that trains have been run at the rate of 35 miles per hour. The cars have four wheels; some of the engines weigh 30 tons.

These rails were of sawed timber laid on cross-ties; and if such roads run with cars and engines with iron wheels at speeds of 16 to 35 miles per hour, and engines of 30 tons have proved so serviceable that their use is extending, there can be no room to question the success of the system here proposed, of solid rails permanently bedded, wooden wheels, light engines with rubber tires and moderate speeds.—*Van Nostrand's Engineering Magazine*.